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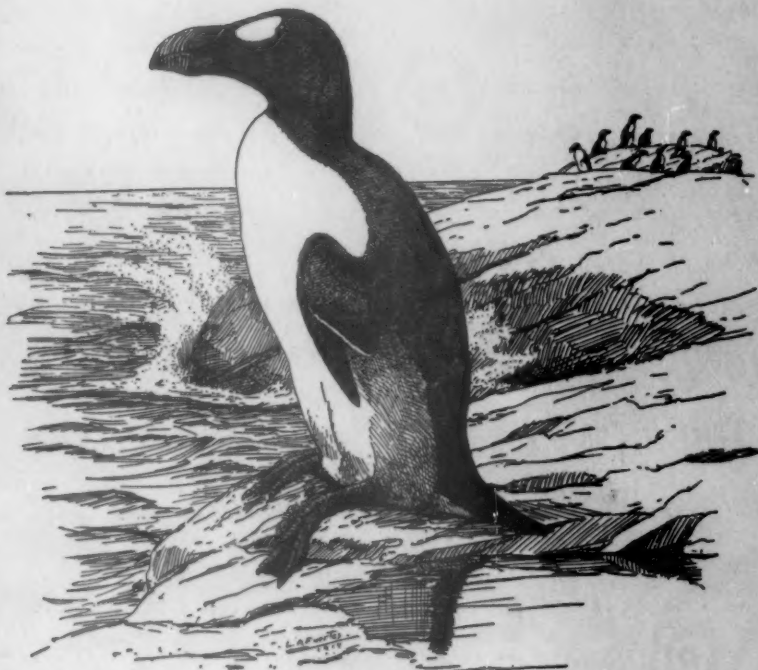
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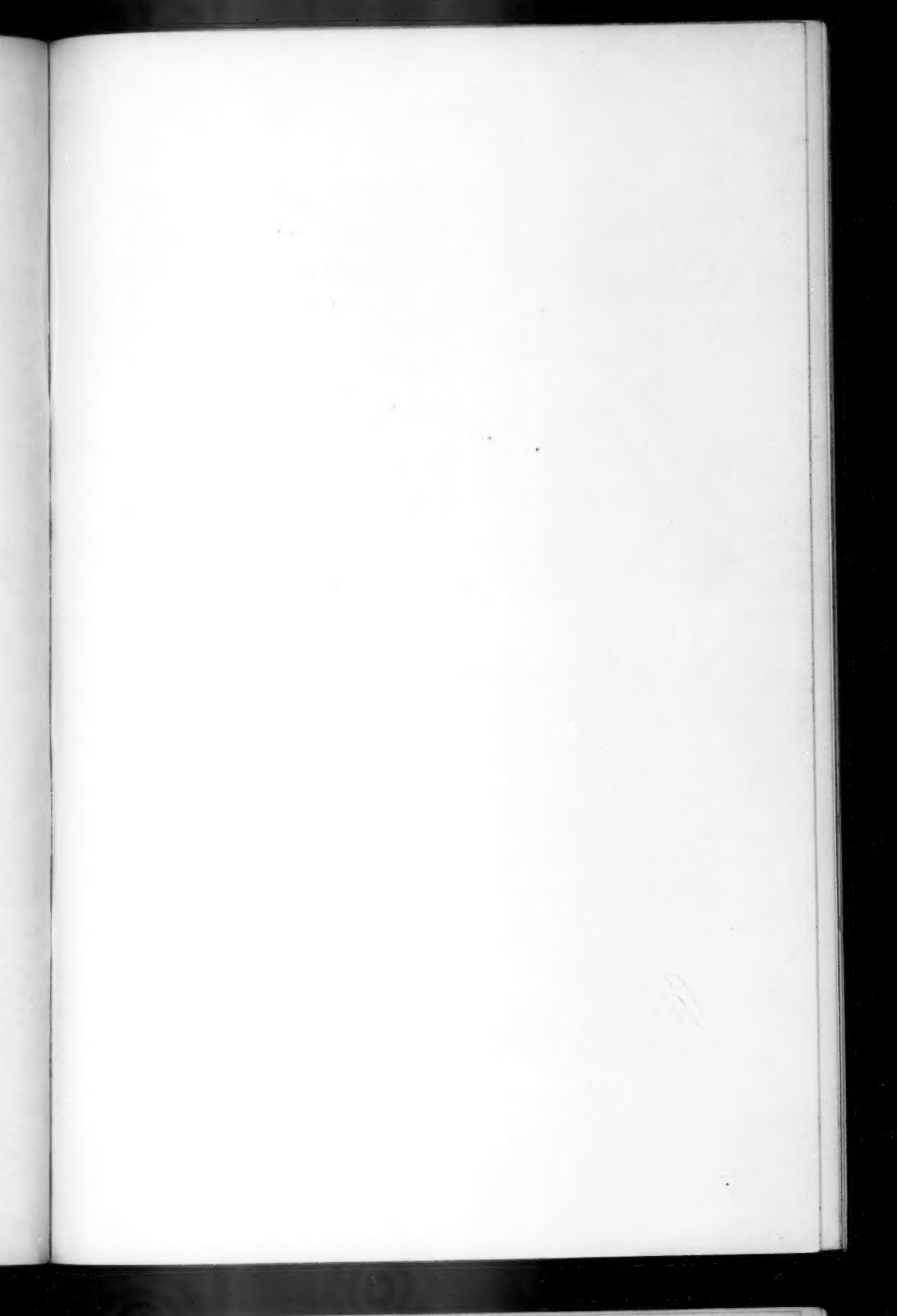
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NESTS OF TWO EIDERS, A HERRING GULL, AND LEACH'S PETREL



EIDER NESTING BENEATH A FALLEN SPRUCE.

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EIDER DUCKS OF KENT'S ISLAND

BY ALFRED O. GROSS

Plates 11-13

KENT'S is an outpost island which guards the mouth of the Bay of Fundy, a body of water between Nova Scotia and New Brunswick, Canada, famous for its extreme tides and treacherous tide rips. One will scan the maps in vain to find the name Kent's but it is a member of a group represented on the marine charts as Three Islands, located about six miles southeastward of Grand Manan, New Brunswick. The island takes its name from that of the original owner, John Kent, who years ago eked out a living from his small farm and the varied products of the sea which surrounded his little island kingdom. Times have changed since John Kent's day and for years the island has been uninhabited, leaving Nature to follow its own course. The isolation of Kent's Island makes it the favorite breeding place of thousands of seabirds and among the notable array of species which make it their home is the finest of our sea ducks, the American Eider. It was Mr. Allan Moses, veteran naturalist of North Head, Grand Manan, who first brought the attention of ornithologists to this bird paradise. He interested Mr. John Sterling Rockefeller of New York City who purchased the island in 1930 as a bird sanctuary primarily for the Eider Ducks. In 1935, Mr. Rockefeller generously gave the island to Bowdoin College with the conditions that a warden be employed to protect the bird life and that the island be maintained as a sanctuary and a scientific station for students of Bowdoin College and other institutions wishing to avail themselves of the unusual opportunities afforded there for study and research. Before the island was purchased by Mr. Rockefeller, the eiders as well as other seabirds suffered persecution at the hands of poachers and especially by egg hunters who ventured there at the height of the nesting season for gull and eider eggs, highly prized as food. The frequent robbing of the nests often extending late in the season threatened the early extermination of these splendid

sea ducks from the region. Since Kent's Island has been made a sanctuary with Mr. Ernest Joy as resident naturalist and warden, the eiders have more than doubled their summer-resident population.

During the winter months great rafts of Eider Ducks, sometimes comprising thousands of individuals, frequent the waters off the southern end of Kent's Island but the birds at this season of the year, for the greater part, are the Northern Eider, *Somateria mollissima borealis*. During severe storms when the sea is churned into mountainous waves the birds are forced to come ashore. One can readily imagine the striking and resplendent scene that flocks of these beautiful sea ducks present to anyone fortunate enough to see them. With the coming of calm weather the eiders, like the Fundy fishermen, again put out to sea for the serious business of fishing. By the end of March these winter residents leave on their migration to nesting grounds along the Labrador coast and northward to the islands of the Arctic.

The American Eider, *Somateria m. mollissima*, many of which winter along the New England coast, is the form represented at Kent's Island during the nesting season. These birds arrive in April after their northern cousins have left the Bay of Fundy. In 1937, the first American Eiders, according to Mr. Joy, arrived on April 7 which is approximately the date when the first arrivals have been noted in previous years. The birds spend the month of April on the rich feeding grounds about the islands. The winter birds ordinarily feed well off at sea whereas the American Eiders come to the shoal grounds where such favorite food as crustaceans, sea-urchins and mollusks abound in inexhaustible quantities. Not only are the shoal grounds about Kent's Island a good provider for diving ducks but the extensive areas laid bare by the excessive tide (twenty-two feet at Kent's Island) provide ideal feeding facilities for the thousands of shore-birds which stop there as a way station on their migration.

Mating.—In 1937, the first mating activity of the eiders was observed on April 26 and thereafter was a frequent occurrence. All of the performances observed at Kent's Island have taken place in the water. The following account of the courtship is based on observations of a group of birds seen off the eastern shore of the island on May 10, 1932. "The female swam away from a flock of about forty-five birds and maneuvered to the lee side where the water was comparatively smooth. She floated with her head outstretched on the surface of the water and in that position drifted along giving an appearance not unlike that of a wounded bird. Meanwhile the members of the main flock continued their diving and feeding in the usual way. As the female drifted, the male bird circled about her, frequently standing upright, flapping his wings and ardently uttering a series of deep cooing calls. This part of the courtship lasted about four minutes after

which the male came close to the female, grasping the back of her head as he mounted on her back. During the procedure the female sank beneath the surface. The copulation was of short duration and after its completion the two birds again joined the flock."

That the eider is polygamous is substantiated by an observation made by Mr. Joy on May 12, 1937. He saw a male bird copulate with three females in the course of thirty minutes. My own observations of several years at Kent's Island indicate that the number of females is greatly in excess of the number of adult males. It is therefore obvious that the number of males is by no means an accurate index to the number of nests in the vicinity.

Nesting.—When I visited the island on May 9, 1932, nesting had just started, for only three nests could be found; one of them contained three eggs and each of the two others had but one egg each. The first nest with an egg found by Mr. Joy in 1937 was on May 4. From this time on the number of nests increases rapidly until the height of the nesting season in June. A census taken during that month revealed more than three hundred nests containing eggs. In June 1932, there were only 178 occupied nests which clearly indicates that the birds are increasing in numbers under the protection given them by the Station through its efficient warden.

The female selects the nesting site, builds the nest, incubates the eggs and cares for the young without any assistance on the part of the male. After the courtship season, the male deserts his mate or mates and never approaches the nesting site. The males may linger offshore and at times, usually at high tides, come on the rocks along the water to preen their feathers and bask in the sun. They are generally accompanied by non-breeding females and immature males. During the month of June many males in a transitional stage of plumage are seen. By the time the incubation of the last eggs is well under way most of the males have deserted the proximity of the island and retreated to more secluded spots to undergo the ordeal of the post-nuptial moult and take on the so-called eclipse plumage.

In the case of many of the nests observed at Kent's Island the female makes a shallow excavation in the soft peaty soil at the site chosen. In this cavity devoid of all nesting material the first egg may be laid but more often grasses, bits of turf and débris are added. The nesting eider seems to take no precaution to conceal the first eggs but, as the set is completed and especially after incubation begins, she carefully covers the eggs with nesting material, chiefly down. Along the coast of Labrador I have noted that down is present in the nest at the time the first eggs are deposited and is amply sufficient to cover them completely, but it is doubtful if this difference in nesting behavior is correlated with a colder climate. If the nest is robbed

of its down, as is frequently done along the Labrador coast and especially in Iceland where the eider down is an important financial consideration to the natives, it is replaced at least in part by the nesting bird. The primary purpose of the down is to conceal the eggs and to serve as a protection for them.

In a mixed bird community such as exists on Kent's Island, the nearby presence of great numbers of different species of birds has had its influence on the details of the eider's nesting behavior. Most of the central and northern portions of the island are covered by a dense growth of tall white spruce, whereas the southern end is free of trees but there are areas with standing dead trees where the ground is generously strewn with trunks and branches. (The spruces, presumably, have been killed by the depositions of the thousands of gulls which inhabit that part of the island.) With increasing numbers the eiders are leaving the open situations which are thickly populated by the gulls and are choosing nesting sites among the spruces of the northern end. In recent years it has not been unusual to find eiders nesting in the seclusion of woods so thick that little light filters to the forest floor through the thick canopy of foliage. At the southern end of the island the majority of the nests are among the tangled masses of fallen dead spruces which also give the female eider a certain degree of privacy. As is generally true with ground-nesting birds there is considerable individual variation in the types of nesting sites. About twenty-five nests are to be found each year in the rank growth of grasses and iris which abounds in the lower swampy portions of the island and again a few are in very exposed places, entirely devoid of vegetation, among the huge boulders near the sea-wall.

Although many of the eiders on Kent's Island seem to avoid the society of other birds by retreating to the depths of the spruce woods, there are others which nest and live peacefully in intimate association with other species. At the southern end of the island in the center of the great gull colony I noted three gulls nesting within a few yards of an occupied eider's nest and in another case an eider nested within four feet of a gull's nest. In the latter case both the gull and the eider were successful in taking off their young unmolested. In June 1932, I found Eider Duck eggs in three nests of the Herring Gull. Two eggs of the eider and two eggs of the gull were in the first nest and one eider's egg was in each of the other nests containing two and three gull eggs respectively. In these three cases the eggs were incubated by the gulls. In the first nest the eiders hatched first. The gull accepted the ducklings and deserted her own eggs to care for them. I was unable to follow up the fate of these young eiders; at least they were not with the adult gull on the following day. Either they perished or it is conceivable that they joined some family of their own kind. In the other

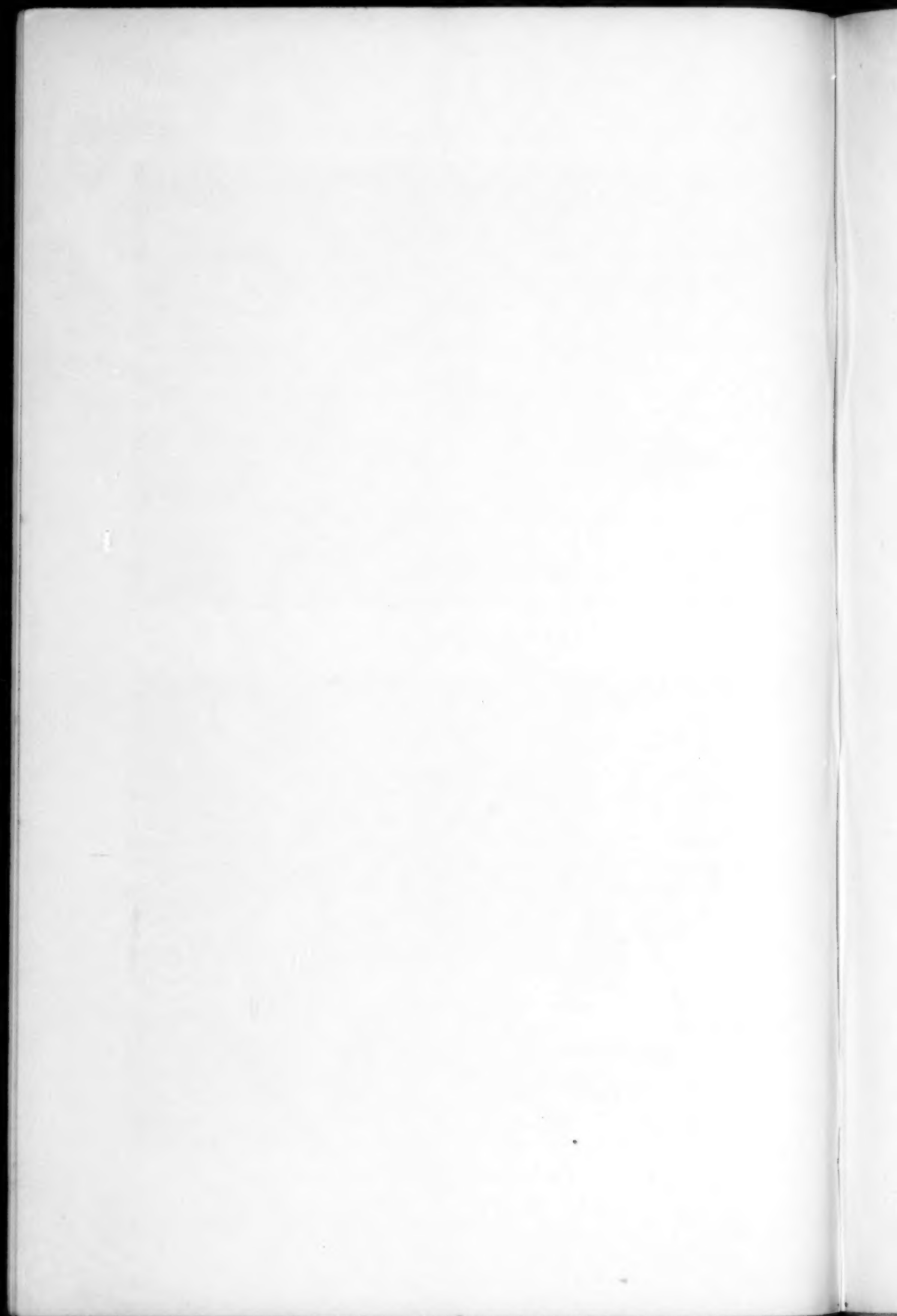


FEMALE EIDER WITH TAIL SPREAD; MALE LEAVING THE WATER



PART OF A GROUP OF AMERICAN EIDERS





two nests the gull's eggs hatched first and the eider's eggs were deserted. The embryos of the eider's eggs were about two weeks old indicating that the incubation of the gull's eggs was under way when the eiders deposited their eggs. Several cases came to my attention in which it was evident that the eider had appropriated a newly built Herring Gull's nest to which she added the usual quantity of down.

The female eider is not a passive creature as we might be led to believe but may exhibit unusual aggressiveness toward her neighbors as is illustrated by the following incident. On June 20, 1932, when observing the behavior of an eider from a blind placed eight feet away from her nest, I saw an eider attack an unsuspecting gull which was standing in her territory as she approached the nest. The gull was badly worsted and made a hurried retreat causing a great commotion among the members of the populous gull colony. The pompous eider then pounced on an innocent gull who was peacefully incubating her eggs about twelve feet away from the nest of the irate eider. The eider deliberately grasped the gull by the neck, violently pulled the surprised bird aside and took possession of the nest. She sat on the gull's eggs for a few minutes and then seeming to be satisfied at being mistress of the situation walked triumphantly to her own nest. The gulls though vastly superior in numbers have apparently learned to respect the eiders. I never saw a gull attack an eider in the manner described above although gulls are guilty of cowardly attacking the downy young when the latter are not protected by the adult eider. The Black-backed Gull, of which there are a dozen pairs breeding on Kent's Island, is a frequent marauder of the young eiders whenever the latter chance into their territory.

The nest of the eider is usually round and fairly uniform in size as shown by the measurements of eight typical nests selected at random. The outside diameter is the limit of nesting material, the inside diameter is the distance across the nesting bowl occupied by the bird and the chief mass of down. The depth is the distance from a straight edge placed across the top of the nest to the bottom of the bowl.

Outside diameter	Inside diameter	Depth
240 mm.	215 mm.	70 mm.
280	235	65
240	210	60
230	212	60
240	230	80
210 x 230	160	60
340	240	85

Eggs.—The prevailing color of a large series of eggs examined at Kent's Island was light vetiver green according to Ridgway's 'Nomenclature of

Colors,' but the shade of green varied in extreme cases from tea green and water green to vetiver green. The eggs are free of markings except for nest stains and calcareous deposits.

The number of eggs in sets known to be complete varied from two to seven. The average number in one hundred nests of complete sets was 4.4 eggs per nest. Nests containing sets of five eggs are common but a nest containing more than five is unusual. Of the hundreds of nests examined on Kent's Island over a course of five years, only two containing six eggs and three containing seven each have come to my attention.

The following numbers of sets of eider's eggs found in nests on islands in Penobscot Bay, Maine, on June 7, 1933, are of interest for comparison and also indicate the state of nesting activities on that date.

Name of Island	Number of nests	Number of eggs
Grass Ledge	2	1
	16	2
	24	3
	26	4
	3	5
	1	6
	1	4 young
	21	empty nests
Sheep Island	1	2
	2	3
	3	4
	2	5
	1	6
Oak Island	3	1
	6	2
	8	3
	8	4
	4	5
	1	5 young

The average number of eggs per set in the above nests is only 3.2 but it is probable that a considerable number of those sets containing one or two eggs were not complete, which accounts for the lower average of the Penobscot Bay nests. The average number of eggs per set in about 150 nests on islands along the Labrador coast was 4.5, practically the same as the Kent's Island average. The largest sets found on the Labrador coast contained seven eggs. One nest containing nine eggs was undoubtedly the product of two females. The weights and measurements of the eggs of ten sets found on Kent's Island during June 1932 and 1933 are as follows,:

Date	Long diameter	Short diameter	Weight
June 17, 1932.	79 mm.	56 mm.	125.4 grams
	77	55	117.5
	78	55	114.9
	75	53	105.5
	80	57	121.2
June 17, 1932.	80	55	109.6
	77	53	94.2
	82	55	112.2
	79	56	106.6
	79	58	116.1
June 17, 1932.	81	56	106.1
	78	54	105.4
	81	53	105.5
	79	52	96.2
	79	54	102.0
June 17, 1932.	81	52	106.1
	77	52	101.0
	83	52	108.9
	77	54	107.7
	81	52	107.8
June 20, 1932.	81	55	111.5
	81	56	120.4
	82	55	120.0
June 20, 1932.	81	56	119.1
	78	55	110.7
	79	55	112.2
	80	56	111.9
June 28, 1932.	74	52	94.5
	75	52	99.5
	75	51	101.9
	73	52	101.1
	76	50	99.6
June 26, 1933.	79	54	120.0
	80	53	117.5
	75	52	110.2
	82	53	119.1
June 26, 1933.	75	53	95.5
	74	52	108.1
	80	50	105.3
	80	52	104.2
	79	52	98.7
June 26, 1933.	82	52	115.1
	79	54	118.2
	79	51	104.6
	77	51	115.3

The number of eggs per set laid by a particular female in successive nesting seasons was determined in the case of three banded individuals. These results seem to indicate that a larger number of eggs may be laid as the birds become older, but further observations are needed to substantiate any generalization. The birds came to the same nesting sites on three successive years.

	1930	1931	1932
Female 1	4	5	7
Female 2	3	5	5
Female 3	4	4	5

There is a considerable decrease in the weight of the eggs as incubation proceeds. The weighings of two sets of eggs are shown in the following tables.

SET NO. 1		SET NO. 2	
<i>First Weighing</i>	<i>Second Weighing</i>	<i>First Weighing</i>	<i>Second Weighing</i>
June 17, 1932	June 28, 1932	June 28, 1932	July 5, 1932
125.4 grams	118.6 grams	94.5 grams	90.2 grams
117.5	110.2	99.5	95.9
114.9	107.3	101.9	98.3
105.5	99.2	101.1	97.5
121.2	114.0	99.6	95.2
Average	116.9	Average	99.32
	109.8		95.42

In the first set the average loss of weight for each egg was 7.1 grams for the eleven days or 0.64 grams per egg each day. In the second set the average loss for each egg was 3.9 grams for seven days or 0.56 grams per day. In another set the average loss of weight was 0.61 grams. The total loss in weight during the entire incubation period is approximately fourteen per cent of the weight of the eggs.

Incubation.—The incubation period of the American Eider according to the following observations is twenty-eight days. On June 6, 1932, a nest containing three eggs was found in a rank growth of iris along the western shore of the island about fifteen yards from the high-tide mark. The fourth egg was laid the next day and apparently incubation started. On June 8, the fifth and final egg of the set was deposited. Little down was added to the nest until incubation was under way. On June 17, a burlap blind was built within six feet of the nest in order to facilitate photography and the making of detailed observations. Experience had shown that a blind placed near a nest before incubation started usually resulted in the desertion of the nest. After a week the instinct to incubate the eggs becomes so strongly developed that the bird seems less disturbed by a strange structure erected

near her nest. After the blind was in place for a few days, it was possible to enter and leave by a rear entrance without flushing the bird. Furthermore she paid no attention to the noises of the camera shutter and other disturbances by the operator inside the blind. In other words it was thus possible to secure natural poses for photography and to study her normal behavior at very close range.

The female incubated the eggs and at no time did the male make his appearance in the vicinity. The female usually left the nest to feed during the morning hours following daybreak. Before leaving she invariably covered the eggs completely. Under normal conditions she did not fly from the nest but walked by a circuitous route along a path through the iris and tall grass to the shore. There mounting a boulder or some other good vantage point she flew to the feeding grounds at sea. At times when there was no surf she did not fly but swam to join in breakfasting with other members of the eider colony. The length of her absence from the nest varied with the circumstances but generally it was for a period of at least two or three hours. It became evident that the thick layer of eider down served not only to conceal the eggs from view but functioned by preventing the chilling of the eggs. As the embryos near the end of development, they produce sufficient heat within themselves and the part then played by the down in retaining the high incubating temperature is of less importance.

In returning, the female flew toward the nesting site with a loud whirr of her wings. Usually she circled two or three times before alighting in the vegetation about twenty-five to thirty yards from the nest. At this point she would pose with her head uplifted as she carefully surveyed the surroundings. If conditions appeared satisfactory she scooted through the grass with her head lowered and well out of view, at least to the observer in the blind. She generally stopped several times on her way to the nest to repeat the careful inspection. Finally when in sight of the nest she seemed to lose all sense of fear and approached without hesitation. She shoved the down aside with her beak, settled on the nest and carefully adjusted her feathers so that the eggs came in direct contact with her warm body. She shifted her position several times and rearranged the down and other nesting material until every part of her household was in accordance with her meticulous standards. She then settled down to the monotonous duty of incubation in an apparent state of comfort and relaxation. She remained motionless for long periods of time; her sombre brown markings harmonized so perfectly with her surroundings that she virtually disappeared from view. In this respect the female offers a striking contrast to the gaudy, conspicuous plumage of her wary mate who seldom even dared to approach the shores of the nesting island. The eggs were turned several times during the course of the day. She did this by thrusting her head through the thick mass of her

breast feathers in such a way that the eggs were shifted or turned without even exposing them to view.

Whenever there was an unusual disturbance, such as an outburst of loud calls by the gulls, the nesting eider would elevate her head to see what it was all about. When the cries of the gulls subsided she again snuggled closely to her nest and assumed her usual complacent posture.

Hatching.—On July 3, the eggs were intact. On the afternoon of July 4, four of the eggs were slightly cracked but at this time the fifth egg showed no signs of hatching. The next morning the fifth egg was pipped and the others were correspondingly advanced. Faint but clear peeps could be heard from the embryos. When I approached the nest at 8 a.m. the female, instead of sneaking through the iris as heretofore, flew directly from the nest with a tremendous *whir* of her wings and as she cleared the grasses and iris uttered a loud quacking call. Just as she took off she extruded a mass of semi-liquid dung all over the half-hatched eggs. I have noticed this happen in the case of other nesting eiders and I am inclined to believe that it is not accidental but intentional on the part of the bird. The unexpected noise accompanied by the spray of filth might well serve to confuse and to discourage certain enemies from molesting the eggs.

The female was much more cautious in returning to the nest than on previous days. In fact she made no attempt to return until 11.30 a.m., three hours and a half after she was flushed. This was not unexpected for at this stage of hatching, the eider often leaves the eggs for long periods of time. The young have sufficient heat within themselves and do not require the incubating mother to keep them warm. Hatching evidently proceeds satisfactorily without the aid of the adult for the period she is away.

When the female finally returned she exhibited a peculiar behavior. After alighting about twenty yards from the nest, she violently jumped up from the thick iris growth and squawked loudly with the evident purpose of attracting the attention of any possible concealed enemy away from her young. She repeated this curious procedure so many times that at first I was led to believe she was being molested by some creature in the vegetation that I could not see from the blind, but this proved not to be the case. After deciding that the coast was clear she walked toward the nest but exercised extreme caution. At every few steps she elevated her head and carefully surveyed the surroundings. When within three feet of the nest she heard the peeps of a young that had hatched during her absence. This lent her courage, she lost all fear, took no further precautions and went directly to the nest to brood the youngster and the four eggs in process of hatching. Whenever the young peeped, she responded with pacifying guttural *gawk, -gawk, -gawk* notes. She worked the eggs frequently with her bill as if to assist the hatching process. She was extremely excited over the

important event transpiring in her household as evidenced in various ways, such as the thrusting of her head up suddenly and gazing intently on the least provocation. Even an ordinary call of a gull near her nesting site was enough to excite her. However, I found no difficulty in photographing the bird at this time for neither the sound of the graflex shutter nor my voice disturbed her. It was evident that she was not in the least suspicious of the blind nor of any of the noises originating there.

The second young hatched at 2 p.m., and the third emerged at five o'clock, twenty-eight days after incubation started on June 8. The two remaining eggs had large openings through which the tips of the bills and portions of the head could be seen. The first young was completely dry and fluffy. It spent much of its time poking its head through the feathers of the brooding bird. It peeped frequently and was answered by the pacifying calls of the mother. These notes were not loud and I doubt if they could have been heard by an observer stationed more than twenty-five feet from the nest. At times when the precocious youngster attempted to wander from the confines of the nest it was an occasion for disapproval and discipline on the part of the mother. I left at six o'clock and by exercising care succeeded in getting out of the rear of the blind without disturbing the bird.

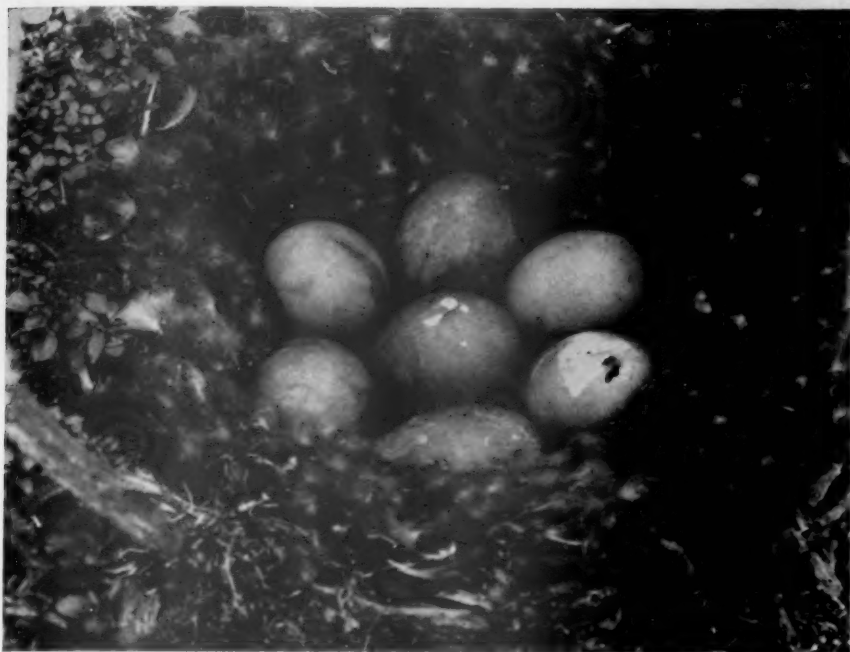
When I arrived at the nest early the next morning the adult was not to be seen. The last two of the five young had hatched during the night but one of them, presumably the last to emerge, was weak and very much bedraggled. The older young were alert and active. They also had the instinct of fear for whenever a gull would fly over the nest and especially if it called, the youngsters would dive into the depths of the downy feather bed. The female returned to the nest at ten o'clock using extreme care and employing much the same tactics she had displayed the previous day. After adjusting herself on the nest, much to my surprise, she brooded the young only a few minutes before walking away along the well-trodden path, calling vigorously as she went. Four of the young readily responded but the one last to hatch was too weak to go. When about three feet from the nest the mother halted until the young reached her, rewarding their efforts by brooding them a moment. After repeating this procedure several times, the family reached the shore and without the least hesitancy the downy armada launched into the cold waters of the Bay of Fundy. The deserted orphan in the nest was placed in my hat with some down and taken back to camp. After being kept in a box near a stove it gained its strength and was soon running about camp as lively as those that had left the nest a few hours before. The next day the duckling fed freely on bits of snails and clams provided for it. The warden carried it about in his pocket and when at the shore allowed it to forage among the seaweeds. It discovered that the little crustaceans commonly known as "sand fleas" were good for food. By

uncovering sheaves of rock-weed hundreds of these leaping creatures kept it busy dashing first this way then that in futile effort to get every one in sight. In the course of a few minutes the little fellow's crop was bulging and so heavy that it was forced to sit down to rest from sheer exhaustion. This little eider was kept at camp for about a week before it was released to join with a brood where it was readily accepted by the foster mother.

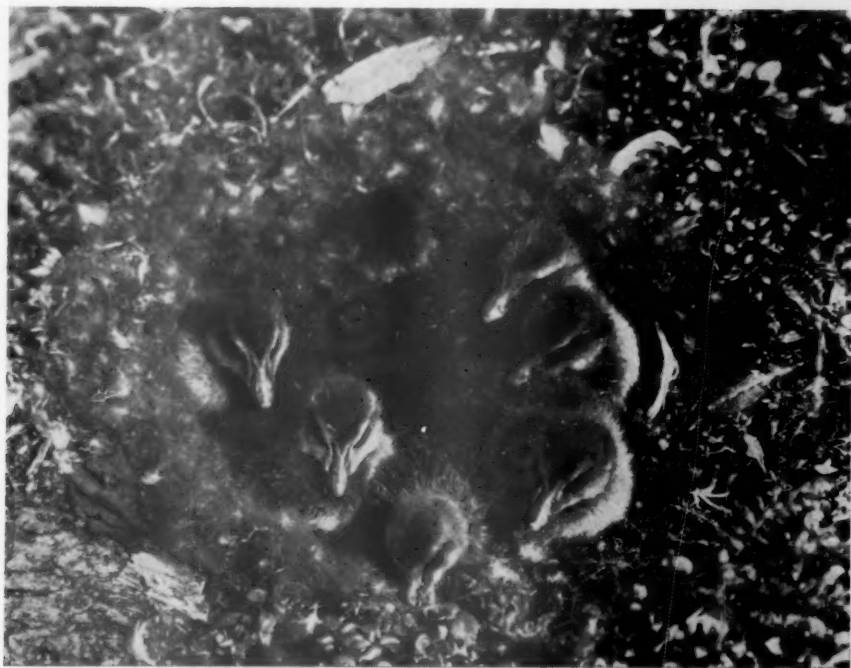
Description of the young.—The following description of a day-old chick was made with the aid of Ridgway's 'Nomenclature of Colors.' Crown, chaetura black; remainder of upper parts, fuscous to fuscous black; the down tips, hair brown; a band above the eye drab gray extending about one centimeter back of the eye where it shades into the chaetura black of the crown and nape; in front, the band of drab gray is separated by the naked posterior extensions of the upper mandible; sides of head below eye hair brown shading to smoke gray on the throat; upper breast light hair brown; lower breast and belly pale smoke gray; mandibles dark neutral gray; extensions of mandible into crown, black; mandibles tipped with drab; egg-tooth chalky white (the egg-tooth quickly disappears and by the time chick is two days old is worn off); iris, olive-brown; legs, toes, webs and nails black.

Measurements of two young one day old made at Kent's Island, June 20, 1932 (weights in grams, measurements in millimeters):—

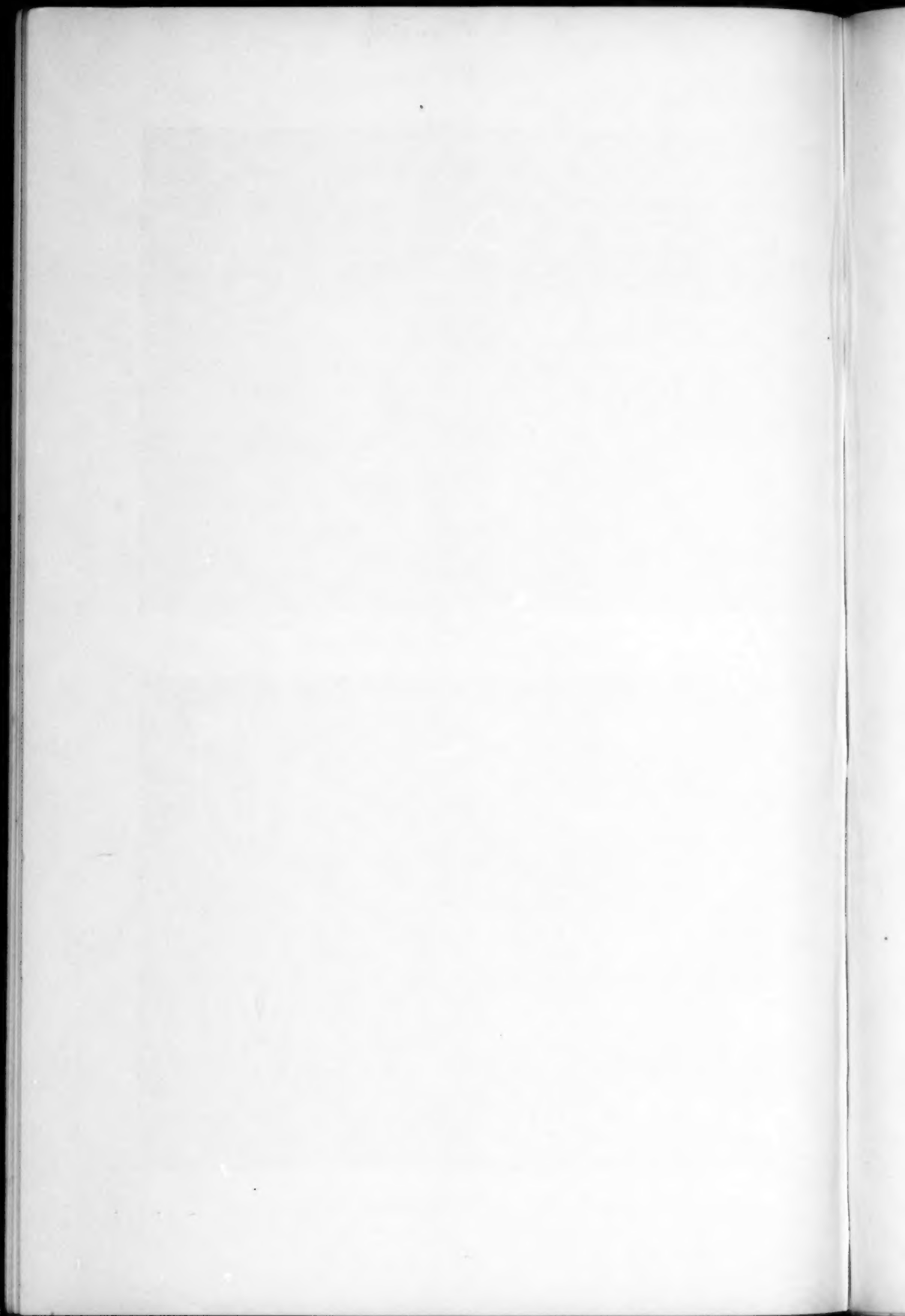
	Number 1	Number 2
Weight.....	73.5 grams	77.0 grams
Length.....	188 mm.	195 mm.
Extent.....	145	146
Wing including down.....	35	34
Manus.....	19	22
Bill length.....	17	17
Bill width.....	11	11
Bill depth.....	9	9
Front edge of eye to tip of bill.....	27	27
Front edge of nostril to tip of bill.....	10	10
Angle of gape to tip of bill.....	21	21
Tarsus and third toe.....	61	63
Third toe.....	33	33
Tarsus.....	28	30
Foot (first toe to third toe).....	55	53
First toe.....	12	12
First toe-nail.....	5	4
Second toe.....	25	24
Second toe-nail.....	4.5	5
Third toe.....	33	34
Third toe-nail.....	5	5.5
Fourth toe.....	34	32
Fourth toe-nail.....	4.5	5



NEST OF AMERICAN EIDER WITH SEVEN EGGS



SEVEN YOUNG EIDERS LESS THAN A DAY OLD



The length of the down covering the different parts of the day-old eider varies considerably. The following measurements represent the average length of the down in the three regions indicated: down of the back, 72 mm.; down of the breast, 12 mm.; that of the crown the shortest, measuring only about 10 mm. in length.

After the nesting season the females remain in the vicinity of Kent's Island with their broods of young. It is usual for two or more females to combine their families evidently for the purpose of protection against a common enemy. During the latter part of July and August one may see groups of eiders made up of as many as twelve to fifteen families, the young varying from downy stages recently out of the nests to others several weeks old. The individual family more or less loses its identity and a female seems to show a maternal interest in any eider young whether they are members of her own or those of some other family.

The young are very adept in imitating their elders in the matter of obtaining food. They are expert divers from the start and even in the early stages of their development obtain food by diving for it. The groups frequently come ashore at high tide especially when the sea is comparatively quiet, but they never go inland any great distance from the water. They clamber to the top of flat ledges or large boulders and there preen their feathers and bask in the sunshine. Sometimes the birds will follow an incoming tide in order to feed on the numerous small crustaceans that live among the great masses of rock-weeds. While an occasional male may make his appearance at the island at this season, he never exhibits any interest in the young. The females have the sole responsibility not only of incubating the eggs but also of rearing the young.

The eiders remain at the island until about the middle of October. In the autumn of 1936, there was a flock of about two hundred and fifty eiders along the shores of Kent's Island on October 12 and 13. On October 14 only three eiders could be found in a careful survey of the entire coastline. Mr. Joy had practically the same experience in 1935 when the remaining summer population of eiders left in a body on October 15. They evidently migrate *en masse* and probably cling together as a group on the winter feeding grounds farther to the south. The winter population of Kent's Island arrives in the latter part of October and by the middle of November is represented by thousands of individuals. At this time they are to be seen in great rafts off the southern end of the island. The winter birds killed by local gunners have proved to be the Northern Eider. Their food is made up largely of sea-urchins, small crustaceans, snails and other mollusks. Entire sea-urchins and mollusks with shells intact were found in some of the stomachs. None of the stomachs examined contained either vegetable food or fish.

Although we are very much interested in the large winter population of eiders, we are chiefly concerned with the nesting colony present during the summer. It is gratifying that the eiders are prospering and that the number of birds nesting on the island has greatly increased since the establishment of the Bowdoin Scientific Station.

EXPLANATION OF PLATES

PLATE 11

UPPER FIGURE.—Two nests of the American Eider and one of the Herring Gull, within a radius of about eight feet. The eider at the left is incubating four eggs and the gull at the right three eggs. The three eggs in the eider's nest toward the foreground are hidden from view by down and nesting material used to cover them. In the background beneath the fallen spruces are the openings to five nests of Leach's Petrel. Kent's Island, June 21, 1932.

LOWER FIGURE.—An American Eider on its nest beneath the fallen trunk of a dead spruce tree. Kent's Island, June 21, 1932.

PLATE 12

UPPER FIGURE.—A male American Eider flapping its wings just after leaving the cold water. An adult female with tail spread in a peculiar fashion stands at the left. Kent's Island, June 17, 1932.

LOWER FIGURE.—Part of a large group of American Eiders on a wave-washed rocky ledge along the eastern shore of Kent's Island, at high tide. In this group are two adult males, three males in transitional plumage and four adult females, the last presumably not breeding birds. June 17, 1932.

PLATE 13

UPPER FIGURE.—Nest and seven eggs of the American Eider at Kent's Island. One egg is in process of hatching, four others are pipped. Taken at 8 a. m., June 20, 1932.

LOWER FIGURE.—The same nest at 3.30 p. m., the following day. An hour later the mother led the whole family to the shore and all plunged into the cold water of the Bay of Fundy.

Bowdoin College
Brunswick, Maine

RING-NECKED DUCK BREEDING IN EASTERN
NORTH AMERICA

BY HOWARD L. MENDALL

DURING the summer of 1937, the writer was detailed to initiate a waterfowl survey of the State of Maine, as one of the projects of the Maine Co-operative Wildlife Station, established through the cooperation of the University of Maine, State Department of Inland Fisheries and Game, U. S. Biological Survey, and American Wildlife Institute. Although the studies are to be continued for several years, distributional data have been secured on the Ring-necked Duck, *Nyroca collaris*, that may be of sufficient interest to warrant a paper at this time. For unpublished data, acknowledgment is hereby made to the correspondents mentioned in this paper, the National Parks of Canada, the New Brunswick Department of Lands and Mines, and the U. S. Biological Survey.

Prior to 1925, the eastern breeding limits of the Ring-necked Duck appear to have been southwestern Ontario, northeastern Minnesota, and eastern Wisconsin. One exception, the breeding of the duck in the St. Croix valley, was recorded about three-fourths of a century ago by Boardman (Proc. Boston Soc. Nat. Hist., 9: 122-132, 1862). It is uncertain, however, whether this occurrence was on the Maine side of the St. Croix River or whether it was a New Brunswick record. That the species has increased in abundance in eastern North America during migrations of the past twelve or fifteen years is a fact well known to field observers. Numerous papers or notes have appeared in 'The Auk', recording the birds in localities where they had hitherto been considered rare or lacking. A few such papers, relating to the Atlantic coastal States, are the following: for Maine, Chamberlain (Auk, 52: 316, 1935); for Massachusetts, Pell (Auk, 53: 323, 1936); for New Jersey, Griscom and Johnson (Auk, 41: 339, 1924); for Delaware, Brown (Auk, 51: 227-228, 1934); for North Carolina, McAtee (Auk, 43: 251-252, 1926) and Wallace (Auk, 53: 227, 1936). Additional data of interest have been obtained through correspondence with other observers. Concerning the species in New York, Dr. Arthur A. Allen of Cornell University, writes: "Forty or fifty years ago it was reported as being a fairly regular migrant through the Finger Lakes region. Between 1907 and 1925, however, it was relatively scarce, but during the last dozen years the bird has been quite regular, occurring in considerable numbers on Cayuga Lake [central New York], "

Ludlow Griscom of the Museum of Comparative Zoölogy, Cambridge, says, in part: "The facts are that from the beginning of the period of historic records down to the year 1920 the Ring-necked Duck was a purely

accidental visitor in the Atlantic States north of southern Virginia. . . . At the present time the Ring-necked Duck is a regular spring and fall migrant throughout the northeastern Atlantic States, and in good years it will occur in some numbers, small flocks from ten to twenty-five, or even forty, birds being regularly recorded every fall and slightly smaller numbers in the spring. In mild winters, like the past one [1936-37], for instance, the Ring-necked Duck winters regularly as far north as Boston, and is, of course, of more frequent occurrence as we proceed southward at that season. . . . There is no doubt, for instance, but what ducks in North America have been steadily and rapidly decreasing in the⁶ last ten years as a whole, and there is also no doubt that in its original breeding area and its original normal wintering area the Ring-necked Duck has decreased more than 50%. . . . Under these circumstances, therefore, the last thing that one would expect would be to have this species become a common and regular transient in a region where it has been nothing but an accidental visitant for the preceding 75 years, and yet this is exactly what has taken place."

Dr. Harrison F. Lewis, Chief Federal Migratory Bird Officer for Ontario and Quebec, states that the species is now one of the commonest of the ducks hunted near Ottawa, and points out the possibility that it may be breeding in the forested regions north and northwest of that city.

Definite evidence of breeding east of the accepted range apparently was first obtained by Pirnie (Michigan Waterfowl Management, Lansing, p. 26, 1935), who comments on the noticeable increase in the species in northern Michigan and says that it was found nesting in the Upper Peninsula in 1928 and in 1930. The breeding season of 1936 brought at least two recorded instances of nesting Ring-necked Ducks in eastern United States, while observations made in 1937 uncovered some entirely unexpected concentrations of the birds in northern Maine and in New Brunswick. During July, 1936, Todd (Auk, 53: 440, 1936) obtained young of this species at Pymatuning Lake in the northwestern part of Pennsylvania. Mated pairs had been seen here the previous May. Swanson (Auk, 54: 382-383, 1937), together with Messrs. C. M. Aldous and F. M. Uhler of the U. S. Biological Survey, located a female with a brood on Grassy Pond, Piscataquis County, Maine, on August 6, 1936. Two weeks later Messrs. Fred Roberts, C. M. Aldous, and the present writer secured two of the young to verify the identification. In late April, 1937, Ralph Palmer, a student at the University of Maine, observed a pair of the birds on the Stillwater River in Oldtown, Maine, and shot the male, which is now in the University of Maine collection.

The following 1937 data were secured by the writer in the extreme northern part of Maine, in Aroostook County: on August 12, an adult male was seen at Cross Lake; on August 20, an adult female was studied at close range at

Eagle Lake. Although she acted as if young were near, a search of the marshes failed to reveal any ducklings. On August 21, nineteen individuals, including two broods, were seen at Mud Lake. One of the young, less than three weeks of age, was secured. A duck, believed to be an adult female of this species, was observed at St. Froid Lake on the same day. On August 23, at least fifty-three individuals, including six distinct broods, were found in the marshes of Portage Lake. Sizes of the various broods ranged from five to eight young, none of which was able to fly.

One breeding record was obtained by the writer in Washington County, the easternmost part of Maine. On August 26, two broods were discovered on the East River, near Crawford Lake. An interesting note in this connection was the fact that one of the broods was made up of ducklings less than two weeks old, despite the lateness of the season. One of the young was taken.

There were several breeding records for New Brunswick in 1937. During a survey made in the spring, Mr. Harold S. Peters, of the U. S. Biological Survey, observed the species in appreciable numbers. According to his unpublished notes, three birds were observed on May 19, between St. John and Moncton; twenty were found on June 12, between Fredericton and Cambridge; and twelve were observed on June 14, at Grand Lake. Peters comments, "Some of these had broods of young, mainly in the Grand Lake area." Lt.-Col. H. H. Ritchie, Chief Game Warden for the Province of New Brunswick, accompanied Peters, and writes that these data constitute his first knowledge of the species as a resident of New Brunswick.

Mr. Robie Tufts, Chief Federal Migratory Bird Officer for the Maritime Provinces, forwarded a copy of his records relating to the Ring-necked Duck, and among these data is the following: "June 9 & 10, 1937. Mr. James Catt informed me that at Priest's Pond, Carleton County [New Brunswick], he saw no less than ten pairs of these birds and stated that they were unquestionably breeding."

From the foregoing paragraphs, it would seem apparent that the eastward extension of the breeding range of the Ring-necked Duck is of considerable importance. During 1937, Peters covered only a limited portion of New Brunswick, while the writer's work in Maine was restricted to Aroostook County and parts of northern Piscataquis and eastern Washington Counties. It seems likely that further studies in Maine and the Maritime Provinces will bring to light additional breeding areas. How long the species has been nesting in this section is, of course, mere speculation. Northern Maine is relatively unimportant from the standpoint of waterfowl shooting, and the presence of Ring-necked Ducks in summer would not arouse the interest that would be occasioned in an area where sportsmen carefully check their local waterfowl populations. Many inquiries were made of game wardens

and local residents as to the past status of the bird, but very few of these people could give any definite information, although some had been aware that "a new kind of duck was in their lakes." Two wardens, whose reliability and powers of observation are good, expressed the belief that the species has nested in Aroostook County for at least five or six years. In view of the numbers of individuals encountered at several bodies of water—particularly Portage Lake—it is quite probable that the wardens are correct in their recollections.

Maine Cooperative Wildlife Station

Orono, Maine

NOTES ON MIGRATIONS OF SOUTH AMERICAN BIRDS

BY JOHN T. ZIMMER

THERE have been many records of North American birds wintering in the tropics or even as far south as the South Temperate Zone and the Antarctic, and such migratory movement is too well known to need more than passing comment here. We have also some data on the travels of South Temperate Zone species of Africa and Australia northward into tropical regions of their own longitudes, but South America has not been documented to the same extent. It is not uncommon, therefore, to hear the statement made that South American birds do not migrate, a statement which is quite erroneous, as will be seen. A few writers have noted the disappearance or reappearance of certain species at certain places and seasons, but there has been little evidence to show where the period of absence has been spent. Within the tropics there is some wandering, evidently in relation to food supply. Such is the case with the Wood Ibis which has been reported to go from the Amazon to the Orinoco during that season when the enormous inundation of the Amazon Valley buries the shallows which these birds require for their feeding.

Various hummingbirds, such as *Rhodopis vesper atacamensis* of Chile, appear to be found in their known haunts only at certain seasons. It is possible that their movements may be governed by the flowering seasons of certain plants, but it is also possible that the cause may be no more than that which operates in better-known migrations. A somewhat comparable condition exists in species like *Agelaius thilius* which keeps to the marshes in breeding time but is more widely distributed in winter. This, as Dr. Chapman has maintained in his studies of Wagler's Oropendola on Barro Colorado, is, in its way, a true migration. Our own Red-winged Blackbird does the same thing. In the Andean regions there is occasional altitudinal movement from higher elevations to lower and return, such as occurs in *Cinclodes oustaleti* of Chile as well as in various North American birds. A still different type of travel is used by some high-mountain forms like *Muscisaxicola albilora* which keeps to the Temperate Zone of the Andes but migrates northward into regions hardly different from those where the breeding season is spent. Hudson and others have noted similar movements of certain lowland species which, like *Lessonia rufa*, nest toward the southern end of South America and spend the winter on the pampas in Argentina and Chile. Nearly allied to this type of movement is the winter crowding of the members of some species into the northern part of their range. Such movement may be difficult to detect except by careful studies in the field since, in the winter home, individuals may be found at all times of the year. It is

comparable to the southward movement of some of our North American birds to the southern States or only as far as they need to go to find their winter food.

Besides all these, however, there are other species which breed in the South Temperate Zone and, in the winter, leave the entire region and move into the tropics, just as many North American birds do when they pass into the West Indies, Central America, or South America. The geographical condition which affects the routes of travel is quite different in the two cases. The North American birds which go to South America are confronted by two major routes of travel to reach the southern continent. The most direct is that across the Gulf of Mexico; the other is by way of Central America, a course which is considerably longer but which can be travelled in a more leisurely manner. Often the eastern birds will carry their journeyings onward to South America while their western cousins will not go beyond some Central American country. Some ancestral factor, no doubt, is here involved, perhaps concerned with the occupation of terrain by the first arrivals, probably the birds from the nearest points of departure. In any case, the migrants over the land route must pass the narrow neck of Panamá, after which they may follow the western coast line, the main course of the Andes, the northern coast eastward from Panamá (sometimes on southward along the Atlantic coast), or a diagonal path southeastward across the Amazonian region. The arrivals from across the Gulf of Mexico are likely to continue southward across Venezuela and Brazil to a variable extent. The exact routes followed by the various migrant species have yet to be worked out in detail, though the study offers interesting possibilities.

On the other hand, Argentine birds which pass northward into the tropics have a wide, and for a long time an increasingly wide, front on which to advance, one which offers no bottle-necked isthmuses or barriers comparable to Panamá and the Gulf of Mexico. Theoretically, then, there is no geographical reason why birds of the South Temperate Zone should not be expected to behave like North Temperate Zone birds in similar circumstances.

The line of mean annual temperature of 70 degrees Fahrenheit in the northern hemisphere passes near the southern border of the United States; in South America it passes through Rio Grande do Sul (in southeastern Brazil), through southern Paraguay and northern Argentina; and turns sharply north on the eastern face of the Andes. The southern tip of South America is near the line of 40 degrees Fahrenheit and its equal in North America passes through Lake Superior and southern Alaska. A criterion of temperature as a factor in migration thus places Argentina, Paraguay, Uruguay, and southernmost Brazil on a plane of equality with the United States and southern and western Canada. If the length of daylight is a

factor in migration, similar equality can be traced in much the same areas although the parallels of latitude are straight lines while the isotherms are not.

If glaciation were a contributing factor in the development of the migratory instinct, it should be remembered that in prehistoric times Patagonia was glaciated and most of Argentina that was not covered by ice was under the sea and therefore equally uninhabitable for land birds. Whatever the cause or the present ruling factors of migration, therefore, the birds of the southern part of South America, south of the Tropic of Capricorn, should be expected to behave in a somewhat similar manner to North American birds of the corresponding latitudes. There is some evidence that they do.

Dr. Chapman (Auk, 46: 348-357, 1929) produced evidence to show that the martin, *Phaeoprogne tapera fusca*, and the swallows, *Pygochelidon patagonica* and *Pygochelidon cyanoleuca*, leave their breeding grounds in the neighborhood of Argentina and Paraguay and winter as far north as the Caribbean coast. Recent studies of certain of the tyrant flycatchers have now produced equally good evidence of similar migration in this family of birds. I shall not give the evidence here in detail; much of it is appearing in my current papers ('Studies of Peruvian Birds,' American Museum Novitates). A brief summary of a few of the conclusions will show some of what has been discovered.

The Swallow-tailed Flycatcher, *Muscivora tyrannus*, may be separated into four subspecies. These subspecies are distinguishable by certain positive characters of color and emargination of the primaries. Failure to recognize these distinctions in the past may well have been the direct result of the migration which one of the subspecies undergoes, since at certain seasons this form invades part of the breeding ranges of all three of the others. This form (the typical one, *M. t. tyrannus*) appears to occur in Argentina, Paraguay, and southernmost Brazil between the months of October and February only. From a little farther north, in Matto Grosso, for example, we have skins dated in August, September, and October, which may indicate dates of passage through the region or may point to the area as lying in the northern portion of the breeding range or the southern border of the winter range. In any case, there are many specimens of this form in the American Museum of Natural History from the Amazon, and regions north of it, as far as Santa Marta, Mérida, the Orinoco, the north coast of Venezuela, and the Guianas, and one skin each from Trinidad and Tobago. These are all dated between February and November, most of them between March and October. The other forms (one from Santa Marta, one from Central America, most of Colombia, and Venezuela, and one from the south bank of the lower Amazon) are represented by specimens taken at various times throughout the year and appear to be residents of their respective

ranges. It is interesting to note that the name of the Argentine form is based on a bird from Dutch Guiana which must have been a wintering individual from much farther south. The Argentine birds breed in somewhat worn plumage in the southern summer. The young are well grown in December and January and the birds migrate northward in February and March. Once on their wintering ground, they are in advanced molt in June and July and are in fresh plumage in August and September, ready to move southward to reach their breeding grounds in October.

Similarly, another large tyrant, *Myiodynastes maculatus solitarius*, is merely a summer resident in Argentina, Paraguay, Uruguay, and southernmost Brazil, from August to April; most of our specimens from the south are dated from September to March. A large series from the Amazon and northward to the Guianas, Venezuela, and Colombia is dated variously from late March to middle September. Dr. Wetmore (Bull. U. S. Nat. Mus., no. 133, 1926) noted the arrival of these birds in Paraguay in the latter part of September, but gives no dates of possible departure. Specimens from Bahia, taken in June, suggest an all-year residence in that latitude. On the Amazon and northward, typical *M. m. maculatus* is resident throughout the year.

Both species of *Empidonomus* have a migratory form. *E. varius varius* breeds in the south some time between September and February and migrates north to the Guianas, northern Brazil, Venezuela, Colombia, and eastern Perú, arriving in March in worn plumage. It molts from April to June and is in fresh plumage in July. Its tropical representative, *E. v. rufinus*, inhabits the extensive area from Bahia and the south bank of the Amazon north to the Guianas and the north coast of Venezuela, in all of which it is resident. *Empidonomus aurantio-atro-cristatus aurantio-atro-cristatus* breeds in Argentina, Uruguay, Paraguay, and possibly adjacent parts of Brazil and Bolivia, some time between middle September and February. A small series from eastern Perú, the upper Rio Negro, and the upper Orinoco shows dates between March and September only. *E. a. pallidiventris* from eastern Brazil, from the Rio Tapajoz to the State of Piauí, is represented by dates throughout the year as befits a resident form.

Myiarchus s. swainsoni from eastern Uruguay, southeastern Brazil and eastern Paraguay migrates to British Guiana, Venezuela, and the Bogotá region of Colombia. The western form, *ferocior*, of northern Argentina, also migrates northward, at least as far as southeastern Colombia.

There is only one plumage and one molt in the birds mentioned, and the state of plumage is different in the summer and winter ranges. The breeding birds are fairly fresh at the beginning of the season, but become more worn as the season advances. Individuals from the winter range are, for

the most part, either badly worn or in process of molt, but prior to departure for the breeding range they are in fresh plumage. The series from the two areas are, therefore, exactly complementary and show the complete succession of plumage-change which is not demonstrable in the birds from either range alone. If the supposed migrants obtained in the north were in the same state of plumage as southern examples dated six months away, there would be considerable doubt as to their being members of the same population at different seasons. Such a case is illustrated by *Myiarchus ferox australis* of the South Temperate or dilute Tropical Zone. This bird has a counterpart on the Orinoco, in the Tropical Zone north of the equator, which is so similar that subspecific separation appears to be impossible. The most pronounced difference between the two populations is that the birds from the south molt in April, are in fresh plumage from May to August, and are ragged in January, while the Orinoco birds molt from August to November, are still in fresh condition in January, and are much abraded in June and July. Obviously the northern birds are not migrants from the south in spite of the great similarity in appearance and in spite of the fact that there is a different subspecies in the intermediate region. The molting season of tropical species is not always uniform in a varied range which may include areas on both sides of the equator or in different river systems. Consequently locally resident forms may have a molting season which coincides, in part, with that of the winter visitants. Fortunately some differentiation of season is often apparent and this, together with the known subspecific differences, helps to determine the true nature of some questionable specimens.

The tropics of the southern continent thus contains two transient elements, one arriving from North America as the other departs for still more southern regions, and vice versa. The two elements are very rarely conspecific. So far I have found only one case where the species is of such wide distribution that it has a migrant form from North America meeting a migrant from Argentina on common ground in the range of a still different tropical form. This species is *Vireo virescens*. In general, also, there is far from exact replacement. The migrants from the north, which come by way of the Isthmus of Panamá, largely follow the Pacific Coast or travel down the Andes to Perú and Bolivia. The northern birds that cross the Gulf of Mexico invade the region more commonly reached by the Argentine and Paraguayan species and it may be found that there is some replacement between these respective forms. At any rate there is ample evidence to show the existence of a well-developed migratory habit in birds of the South Temperate Zone of South America, comparable in its major aspects, if not in actual degree, with that of the North American avifauna. We have assurance by various careful students in and of South America that many

species are of only seasonal occurrence in particular regions. We have far to go before we learn where all of these spend the remaining portions of the year or by what routes they reach their objectives. It is an interesting field which is open for study.

American Museum of Natural History
New York City

INTELLIGENT BEHAVIOR IN THE CLAPPER RAIL

BY OLIN SEWALL PETTINGILL, JR.

Plates 14-15

OF twenty nests of the Northern Clapper Rail (*Rallus longirostris crepitans*) found at Cobb Island, Virginia, June 24-26, 1933, one was selected for a study of the nesting birds. This particular nest was located at least twenty feet from a salt marsh in a thick growth of sedges bordering the island's broad sand beach. So thick and rank was the surrounding vegetation and so greatly did it slant in one direction over the nest that the nest was concealed from view even from a position directly above it. Within four feet of the nest I placed a burlap blind and cut away the sedges on one side of the nest to permit observation through a small opening in the side of the blind facing the nest.

On July 2, I entered my blind while the bird was absent from its nest. After a ten-minute wait I suddenly noticed a few sedges moving behind the nest, then the head of the rail peering through them. It was panting noticeably, and its lower mandible was lowered with each exhalation and closed with each inhalation. Slowly, cautiously, it stepped over the eggs, covering them and adjusting them for brooding. For fully five minutes the rail (sex undetermined) incubated, remaining quiet except for its heavy breathing. At the end of that time some slight movement on my part within the blind frightened the bird, and it departed hurriedly. In a few minutes it returned, became suspicious of my presence, and hastened away again. Several times within the next fifteen minutes it appeared and disappeared; finally it became used to sounds emanating from the blind and stayed calmly on the nest. But the bird was not accustomed to the sharp sound that my tripod caused when, sliding down the side of the blind against which it was precariously leaning, it struck the ground. The rail, startled, was out of sight in an instant. As it jumped from the nest it accidentally pushed out an egg with its foot. When it returned and began to incubate, it immediately saw this egg resting on the ground eight inches away from the edge of the nest. After gazing at the egg steadily for nearly three minutes, it slowly reached out with its bill and with the tips of the mandibles poked gently at the surface and turned it over a number of times. Then, quite unexpectedly, it grasped the egg crosswise at the widest part, lifted it up, and brought it back to the nest beside the other eggs.

Wishing to secure photographs of this impressive behavior, I flushed the rail from the nest, set up my camera in the blind with the lens projecting through the hole toward the nest, and placed the egg in the same position it had occupied when dislodged. The bird returned almost as soon as I was

prepared. It repeated the performance with little hesitation and with little poking at the egg's surface. In fact, the egg was put back into the nest so quickly that I secured but one photograph, that of the bird starting to lift the egg. Again I flushed the bird, removed the egg as before, and again I secured an exposure, that of the bird lifting the egg. Eight times more I flushed the bird and removed the egg, and each time the bird returned the egg!

My series of photographs of this egg-returning act was now complete (see Plates 14-15). I then experimented further with the rail, to the extent of placing the egg a foot away from the nest, a distance sufficient to make the bird leave the nest in order to bring it back, yet easily in line with the bird's vision. This time the rail, after returning, stepped from the nest, picked up the egg, turned around, put the egg beside the others, and settled on the nest.

The day following this experience with the Clapper Rail, Cobb Island was flooded by an almost unprecedented high tide. Although this particular nest was located on the edge of the dry beach, it was low enough to be washed away, as were all the other nests in the vicinity. This disaster, therefore, terminated further experiments with the nesting birds, but it was not without some reward. It brought me an experience with a brood of Clapper Rails that would otherwise never have happened.

During the high tide I stayed in Captain George W. Cobb's house. This was ideally located on the southern end of the island and afforded an extensive view of a large portion of the island to the north. Placed back from the beach behind a ridge of sand dunes, the house rested on piles some seven or eight feet above the salt marsh that began below the house and stretched far to the northwestward and westward. Protected thus from high water and the surf, it was a safe place under such conditions.

The tide that occurred on this day completely inundated the marsh and came to within one foot of the floor of Captain Cobb's house. While this tide was rising, I counted six pairs of adult Clapper Rails and their broods swimming above the marsh, striving desperately to reach the dunes, which were the only parts of the island still above water. But the northeast wind was driving them to the southward and made their attempts at reaching shore seemingly useless. Two broods ultimately came ashore; three others were swept past the southern point of the island to death in the rough ocean. The sixth brood was blown directly toward the house. My attention was naturally directed toward the welfare of the family group.

As this brood rapidly drifted toward the house, I was able to discern seven young birds, all of which were about of an equal age. I judged that they were two weeks old. They were barely able to keep their heads and backs above water. Waves, freshly whipped up by the wind, continually

washed over them, soaking their down and making them less buoyant each time. They seemed about to succumb and were making no attempts to swim. The two parent birds, however, were large enough and strong enough to keep their heads above the waves breaking over them and were swimming anxiously about their young. Every now and then the old birds would head toward the dunes but, seeing that their offspring were not following, would turn back and continue encircling them. In a very short time the rail family was floating along past the house. Captain Cobb and I soon rescued the seven young birds by plunging into the water and gathering them up and bringing them to the porch. We placed them in a carton two feet square and closed the four flaps. As a result of our interference the parent birds made away to the sand dunes calling loudly. Darkness set in before the tide went out, and the young rails passed the night in the carton on the porch. While their down was soaked and they seemed utterly exhausted, scarcely moving when we touched them, they were old enough and the temperature of the surrounding air was warm enough to permit their survival without brooding.

At sunrise the next morning we were awakened by the calling of the young birds in the carton and the noisy clatter of the parent birds which were frantically searching about beneath the house. Looking through the window on to the porch, we saw one parent bird fly to the porch floor and walk directly to the carton. Several times it walked around the box, striking at the sides as it did so. It jumped nimbly to the top and picked up the loose end of one of the flaps with its bill, lifted it up, and flipped it over backward. This allowed a small opening between the two underlying flaps, through which it thrust its head. Immediately, it made a quick thrust at one of the young birds. To us it appeared as if the old bird had actually grasped one of the young birds, but the young bird was too large to be drawn through the opening. Consequently the adult let go and remained on the box, continuing its clatter. When we went out on the porch to open the box, the old bird flew to the marsh grass below. The young birds were strong enough to hop out hurriedly, jump down from the porch, and follow their parent away. We last saw the young birds going through the marsh grass, responding to the coaxing sounds of their parent.

This episode, I found, was not new to Captain Cobb. During a high tide of the previous summer he had rescued a brood of young rails scarcely a week old. He had placed them in an open box on his small hand-cart and left them on one of the dunes during the storm. The top of the box was about three feet from the ground. Going back to his house, he observed that in a short while the cries from within the box attracted the parent birds to the vicinity. One adult, the bolder of the two, came up and circled the cart a number of times, walked underneath it, and then hopped first to the

edge of the cart, then to the top edge of the box with a young bird held firmly between its mandibles. It jumped to the ground with the burden and put it down, and both disappeared into the grass. Wishing to keep the remaining brood for a group of ornithologists who were coming the next day, Captain Cobb removed the birds to a large box resting on the ground. The open top of this box was at least three feet from the ground. To his surprise the same thing happened. An adult bird returned, found its way *directly* to the top of the box *without circling it*, and removed another young bird. Captain Cobb finally covered over the top. Toward night an old bird was back again and was standing and moving nervously about on the covers of the box. The young birds that had been previously removed were nowhere to be seen, having presumably remained in the grass with the other parent.

To my mind these acts of egg-returning and young-carrying showed intelligent behavior. I grant that they had as their basis the instinctive, cyclical drives to incubate *all* the eggs and to solace by brooding *all* the complaining young. Yet, in submitting to the driving force of instinct, they showed at least a coating of intelligent behavior by readily adapting themselves to certain circumstances that were not a part of their ordinary reproductive routine.

Let me analyze these cases more fully, to show in what ways intelligent behavior was evident. The egg was out of the nest and obviously could not be covered with the others. It was down among the dead grasses over the edge of the nest; it could not be easily rolled back over these entanglements with the bill; it could not even be reached from the nest with the bill, in the last instance. Similarly the young were separated from the adult by the sides of the carton; they could not be coaxed out. Where with most species of birds the egg would have remained *in situ* and the adult might or might not have forsaken its own nest to incubate the dislodged egg, and where with most species of birds the young would have remained in the carton until death by exposure or until removal by some animate means, the rail, through the medium of its long and strong bill, found a way of overcoming the conditions, which it instinctively realized were wrong; and it found this way by its capacity to adjust itself to a new situation. Thus by lifting the objects bodily it was able to change the conditions to suit its instinctive mental pattern.

Let me further analyze these cases for evidence of intelligent behavior. The second time and the times thereafter that the rail returned the egg to the nest, it acted with little hesitation. It did not fumble at the egg nor move it about, but picked it up and returned it deliberately. It even grasped the egg deliberately when it left the nest to bring it back. The adult rail that Captain Cobb observed returned to the taller box the second time,



CLAPPER RAIL APPROACHING ITS NEST



AN EGG DISPLACED OUTSIDE THE NEST



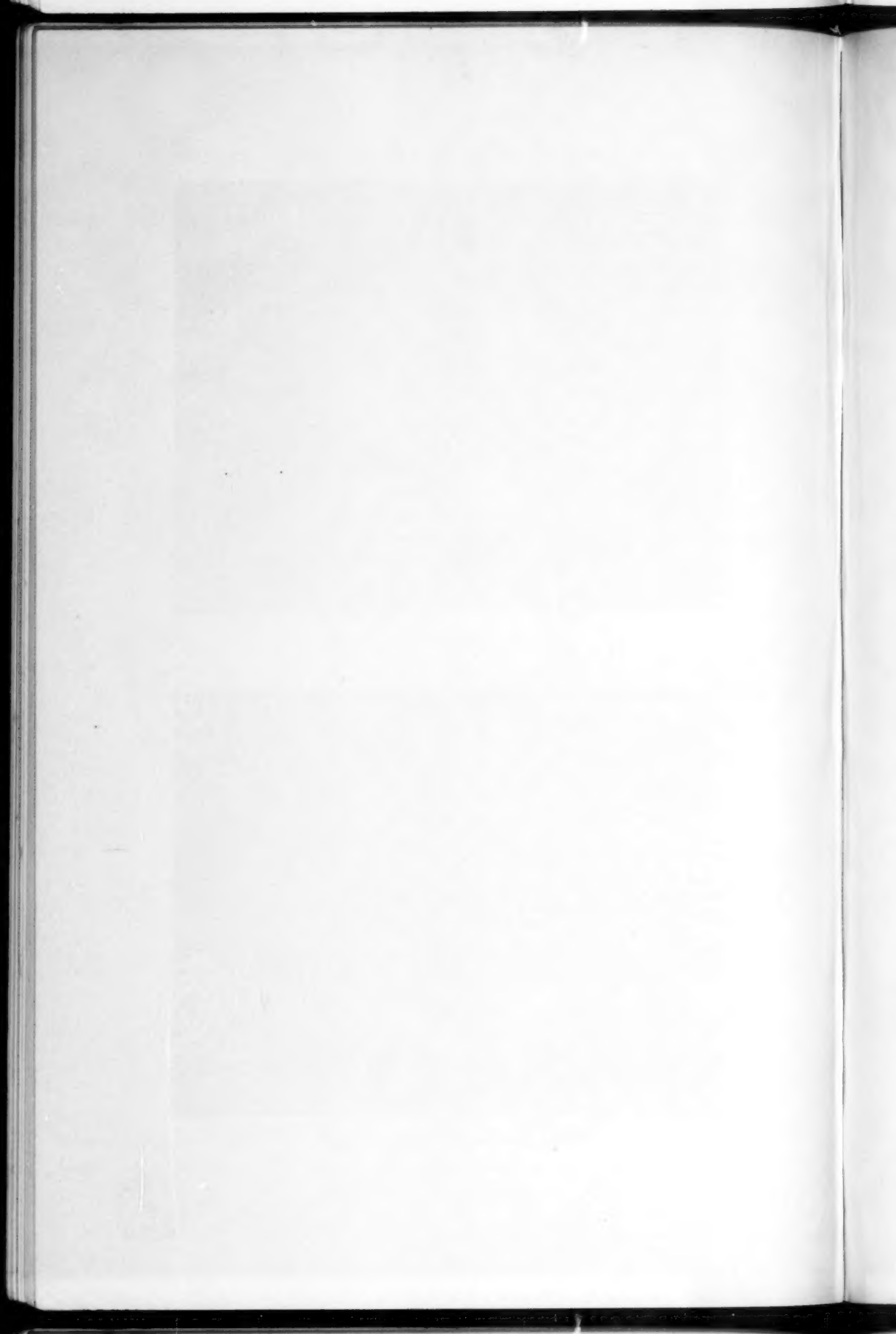


CLAPPER RAIL SEIZING DISPLACED EGG



RETURNING DISPLACED EGG TO NEST





flew directly to the top, went in, and did not bother to circle it as it had circled the box on the hand-cart. These rails learned by experience. Where they hesitated the first time, they acted more deliberately the second time. Had their acts been instinctive, they would not have learned by experience. But they *did* profit by experience, and their behavior was, to my mind, intelligent.

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VARIATIONS IN THE WEIGHT OF BIRDS¹

BY S. PRENTISS BALDWIN AND S. CHARLES KENDEIGH

INTRODUCTION

IN spite of the fact that the weight of birds may be easily obtained, there is very little information available for wild species. Very few collectors in the past have taken the trouble to weigh the birds that they obtain for taxonomic purposes. One reason for this may lie in the lack of a suitable portable weighing instrument. A more important reason why the weighing of birds has not been more commonly done may lie in the recognized variability of bird weights and the consequent lack of appreciation of their importance. Yet the weight of birds and the variations and fluctuations of these weights furnish criteria of considerable importance in the understanding of the physiological and ecological reactions of the bird as a living organism. The physiology of the bird, its behavior, and the influence of environment are interacting factors, no one of which can be understood without a knowledge of the two others. The weighing of all birds collected might well be made a fundamental policy in all museums. There is a developing tendency to do so among some of the younger ornithologists. A good accurate balance may be obtained at a very reasonable price. Bird-banding operators have an especially good opportunity for obtaining weights of living birds of many species and also of the same individual bird at frequent intervals.

At the Baldwin Bird Research Laboratory, Gates Mills, near Cleveland, Ohio, the first weights of birds were obtained in 1925, and in 1926 the weighing of all birds taken from the banding traps became an established practice in the laboratory routine. The present paper is an analytical summary of the data obtained during the nine years up to January 1, 1934, in the course of which 13,546 weights were obtained of 5812 individuals representing eighty-five species. More than ten individuals were weighed in each of thirty-three species, and these receive major consideration in this report.

Acknowledgment is made of aid from the following persons who, as assistants in the laboratory during various periods, have been of much help in gathering these records: Rudyerd Boulton, W. W. Bowen, Leonard G. Worley, Delos E. Johnson, Carl Johnson, James Stevenson, Theodore C. Kramer, and Roscoe W. Franks. We wish to make special acknowledgment to Dr. Worley who was actively interested in this line of work while at the laboratory and made a useful preliminary summary of the first four years' data.

¹ Contribution No. 32 from the Baldwin Bird Research Laboratory, Gates Mills, Ohio.

LITERATURE

No attempt is here made to review in an exhaustive manner all the literature on bird weights. Attention is centered not on the average and extreme weights of individual species, but on analysis of the variations in the weight of individuals and species under different circumstances. Data on the weight of various species have been recently obtained or compiled from the literature by Krohn (1915), Bergtold (1917, 1926), Hesse (1921), Heinroth (1922), Przibram (1922), Weigold (1926), Whittle and Whittle (1926), Esten (1931), Roberts (1932), Groebbel (1932), Fiora (1933-34), Wetherbee (1934), Marples (1935), Mountfort (1935), Stewart (1937), Imler (1937) and Nice (1938). Several of these authors, as well as Knappen (1928), give useful bibliographies relative to the weights of birds.

Some authors are content with giving single or average weights, with or without indication of the limits of variation. In some cases, distinctions in weight between the two sexes or between adult and immature birds are made, but seldom is any extensive analysis given. Those in the above list who have obtained weights of living birds taken from banding traps are Whittle and Whittle (1926), Wetherbee (1934), Marples (1935), Mountfort (1935), Stewart (1937), Imler (1937) and Nice (1938). Most students, especially those who have weighed living birds and often the same individual at different times, are impressed with the great variability in their weights. Groebbel (1932) finds this variability relatively greater in small than in large birds. Linsdale and Sumner (1934) adequately emphasize this variability in their statement that the "weight of a bird is not a static quality but is one of continuous and ordered change." Other literature dealing with specific problems will be considered in the various sections that follow.

METHODS

Practically all the weights entering into the present study were obtained from living birds; a very few were obtained from birds collected for other investigations. All the living birds were gathered, at intervals of two or three hours, from the banding traps scattered over the fifteen or more acres immediately surrounding the laboratory. They were brought to the laboratory in small gathering cages and weighed immediately. All the birds had thus been recently feeding and had a varying amount of food undergoing digestion in their alimentary tract. Differences in activity and diet previous to entering the traps may have influenced the weights obtained, but these were beyond control.

According to Stevenson (1933), the amount of food in the stomachs of twenty-five adult Song Sparrows,¹ English Sparrows, Starlings, and White-

¹ Scientific names of species are given in Table 5, page 436.

breasted Nuthatches averaged about 1.5 per cent of the body weight. If as much is in the small intestine and a similar amount is in the large intestine and cloaca, about 4.5 per cent of the body weight may represent unassimilated material. Single excrement droppings in these small birds average less than 0.5 per cent of the body weight. A correction of this amount (plus an allowance of about 0.5 per cent for weight of the band on the bird) may be made, if desired, to give the approximate basic weights of the birds. This correction has not been made in the present study because of a desire to follow the natural weight fluctuations of birds in the wild.

The bird for weighing was placed in a rectangular aluminum box (5 by 3 by 3.5 inches) with a loosely fitting cover. As the bird was here in darkness it generally remained quiet, and there was no danger of suffocation. Weights were taken on a small Cenco balance. The box was accurately counterbalanced by means of No. 12 shot, so that the weight of the bird could be read directly without subtracting the weight of the box. The counterbalancing of the box was performed before each weighing because of gradual accumulation of excrement voided by the birds while in the box. The bird was banded and examined before the weighing was done, so that by removing the cover from the box, it could at once be released without further handling. The bird was not in any way harmed by the procedure and often returned to the traps several times a day. The weights of wet or obviously sick birds were not included with the other data. A largely negligible loss in weight of the birds may have occurred from time of removal from the traps until the weight was taken. A careful calibration and checking of the balance and weights indicated in weighing up to 20 grams, an accuracy of ± 0.1 gram, and between 20 and 200 grams an accuracy of ± 0.2 to 0.3 gram. Since much of the following discussion is based on weight averages, many of these small plus and minus inaccuracies in individual weights are largely eliminated.

Since weights of all birds are included in this study, although some individuals were weighed only once and others many times, a special study was made of the effect of the 'trap habit' on fluctuations in weight. It might be expected that where a bird comes repeatedly to the traps and thus obtains much of its food, there would be an interference in the weight physiology of the bird. Adult Chipping Sparrows were used to study this point because only in this species were there sufficient records for a single month (May) between the hours of 8.30 a.m. and 5.30 p.m. free of the influence of age and sex (see beyond).

Table 1 shows an increased amount of fluctuation in the weight of an individual, as represented by the average standard deviation, with an increased number of times it repeats in the traps. This increase, at least the extreme value, is of fairly high statistical significance. However, this in-

TABLE 1

Variability in weight of adult Chipping Sparrows correlated with number of times captured and weighed; there is no sex difference in weight of this species

Number of times bird weighed	Number of birds	Average weight in grams	Average standard deviation, grams ¹
2- 6	30	12.4	± 0.40
7-10	24	12.4	0.50
11-20	15	12.2	0.54
21-	4	12.2	0.63

creased fluctuation in weight seems not to be due to any influence of the trap habit in itself but rather to the longer period of time necessarily covered during which the bird is subjected to a larger number of influencing factors. Another reason for believing that the trap habit has no intrinsic effect is that the average weight of the birds is nearly the same regardless of the number of times they were caught. The difference of 0.2 grams is not statistically significant. In the case of a very few individual birds of other species, notably the Cowbird, and occasionally a Song Sparrow, a persistent trap habit did show a positive effect, in being associated with a considerable loss of weight. Such records were eliminated from the averages given in this paper. In most instances the number of records obtained from individuals that did not acquire the trap habit greatly outnumbers those that did, and so no correction or further consideration of the trap habit will be made.

In developing a method for analyzing the weight data, the importance of variations between individuals had to be considered. Here again it was most convenient to work with the data on adult Chipping Sparrows. The average weight of each of forty-three individuals was obtained. All individuals had more than six weights and these were all taken between the hours of 8.30 a.m. and 5.30 p.m., during the month of May for various years. The standard deviation of the weight records around the mean weight of each individual was computed in order to determine the amount of fluctuation that occurred in the weight of each individual bird. The average of these standard deviations for all individuals was ± 0.53 grams, with the extreme values ± 0.15 and ± 0.94 grams. The grand average weight of all the individuals was 12.3 grams. There is no sex difference in weight in this species. The standard deviation of the average weights of individuals from this grand average was ± 0.63 grams. The difference of 0.10 grams in the two standard deviations is small and not greatly significant. The information indicates that differences in weight between individuals may occur,

¹ The standard deviation includes within its limits 68 per cent of all random fluctuations in weight around the true average. According to the law of variability, if an indefinite number of weights were obtained, where the average weight with its standard deviation is 12.4 ± 0.40 , 68 per cent should fall within the range 12.0-12.8. Differences in size of the standard deviation are thus a measure of variation of values around an average.

but it is suspected that if all conflicting factors, as time of day, stage of reproductive activity, recent time of feeding and defecation, weather, and other factors were rigidly eliminated, these individual differences would be smaller even than here indicated. As it is, the conclusion is warranted that differences between the average weights of different individuals are very little if any greater than differences in the weight of the same individual at different times.

The next step was to average, without regard to the individual, all the records (525) upon which these individual averages were based, i.e., each record was given equal value with every other record whether it was one of thirty or more of the same individual or only one of seven. This gave an average of 12.3 ± 0.87 grams (coefficient of variability—7.1). The average is the same as the grand average of the weights of the separate individuals, although the standard deviation is significantly higher by ± 0.24 grams. This means that random weights may be obtained that are higher or lower than the average weight of any individual bird. Comparing this standard deviation with the average standard deviation in the weights of individual birds (± 0.53 grams, coefficient of variability—4.3) shows also that the possible fluctuation between weights within the species is greater than it is in the case of the average individual. The difference between their coefficients of variability shows the same thing. In an occasional individual, however, the standard deviation of single weights around the mean for that individual may be greater, as witness the standard deviation of ± 0.94 above mentioned.

Another factor involved in the extent to which a bird's weight may fluctuate is the relation of an individual's mean weight to the mean weight of the species. This is shown in Table 2 using the same data as above.

TABLE 2
*Extent of weight fluctuations in individual adult Chipping Sparrows of
different average weights*

Range of average weights in grams	Number of birds	Average standard deviation, grams
11.0-11.4	4	± 0.64
11.5-11.9	8	0.52
12.0-12.4	10	0.46
12.5-12.9	15	0.52
13.0-14.1	6	0.52

Since the average weight of the species here considered is 12.3 grams, the data in Table 2 show that an individual varies least in weight when its average weight most nearly agrees with the average of the species. However, the greatest difference in standard deviations is only ± 0.18 grams and this is not statistically very significant. The difference of ± 0.06 is almost

negligible. After taking these various factors into consideration, particularly that the individual may vary in weight at different times and under different circumstances almost as much as the species taken as a whole, it was decided not to put major stress upon individual differences in the compilation and analysis of the data, but to analyze the records of weights irrespective of the individuals on which they were obtained.

The species are listed in the tables that follow in the order of the abundance and reliability of the data for each. Some species are listed in these tables for the sake of completeness although the number of data in their cases are too few to support any generalizations by themselves. When taken in conjunction with the more numerous data for the other species, they have a suggestive significance.

The identification of all banded birds as to sex and age is obviously of great importance in any study such as this. However, this was not actually done in many instances because of the inexperience of the assistant or of apparent difficulties in so doing. A very useful and convenient means for distinguishing the sexes in the House Wren, sparrows, flycatchers, and other species in which the male and female are similarly colored and where it is certain that only the female incubates, is the absence of down feathers in the ventral apteria of the female. This character is useful only during the breeding season. Many individuals were caught in both the breeding and the non-breeding months, so that after having once been sexed during the breeding season, differences could thus be followed into the non-breeding months. Differences in age, i.e., whether adult or juvenal, were determined by differences in markings, in coloration, and in texture of feathers. Juvenal birds also commonly have a yellow pigmentation at the inner angles of the bill that is rather conspicuous. By using one or more of these various methods, most juvenals could be distinguished from adults. When there was any doubt as to sex or age, such records are not included in the averages.

SEX DIFFERENCES IN WEIGHT

The first item in the analysis of the weight data was the study of sex differences (Table 3). All records are included regardless of the number obtained from the same individual. Records are included for all hours of the day regardless of the hourly differences in weight, since the weights were fairly well distributed throughout the day. All records are averaged separately for each month in which data are available for both sexes of a species and then a grand average is made of these monthly averages. This was to allow for possible monthly variations in weight. After a careful examination of the data, an arbitrary limit of 3.0 per cent of the male's weight was selected as representing the lowest amount of difference between the weight of the sexes that could be considered significant. A study of

Table 3 shows that, in nearly all instances, the two sexes weigh either approximately the same or the male is the heavier. In four species the female weighs significantly more than does the male.

When a larger number of records is obtained, the sex differences noted for some of these species may not be substantiated. Stewart (1937) and Nice (1938) found very little difference in the weight of male and female Bob-whites. Wetherbee (1934) found that male Towhees weighed 6.4 per cent more than females but on the basis of only fourteen weights. She verifies our finding that female House Wrens are heavier than the males but found no significant difference between sexes of the Robin. Her female Goldfinches weighed slightly more than the males. Nice (1938) agrees with our sex difference of weight in the Robin in the spring, but finds male

TABLE 3
Sex Differences in Weight of Adult Birds

Species	Months	Male		Female		
		Records per month	Average weight grams	Records per month	Average weight grams	Percentage different from male
<i>Group A—Males and females of approximately same weight</i>						
Chipping Sparrow	4, 5, 6, 7, 8, 9	111	12.3	82	12.0	- 2.4
Field Sparrow	4, 5, 8	26	12.7	4	12.7	0.0
English Sparrow	1, 2, 3, 4, 6, 7, 8, 9, 10, 12	9	27.7	8	28.1	+ 1.4
Downy Woodpecker	1, 2, 3, 4, 5, 6, 7, 8, 9	8	27.2	7	27.2	0.0
Towhee	3, 4, 5, 7, 8, 9, 10	8	41.7	7	40.9	- 1.9
Cardinal	1, 3, 4, 5, 6, 7, 8, 9, 10, 11	6	43.5	3	43.1	- 0.1
White-breasted Nuthatch	2, 3, 4, 5, 6, 7, 8	3	21.3	4	21.0	- 1.4
Bluebird	6	2	30.2	2	29.6	- 2.0
Red-eyed Vireo	5, 8	1	16.0	1	15.6	- 2.5
<i>Group B—Males significantly heavier than females</i>						
Song Sparrow	4, 5, 6, 7, 8, 9	81	21.3	46	20.5	- 3.8
Slate-colored Junco	4	54	21.4	63	19.9	- 7.0
Cowbird	4, 5, 6, 7	8	46.4	18	38.7	-16.6
Brown Thrasher	5, 6, 7	4	69.9	18	66.5	- 4.9
Mourning Dove	5, 6, 7, 8, 9	10	139.6	4	131.8	- 5.6
Black-capped Chickadee	1, 4, 5, 6, 8	3	11.5	3	10.3	-10.4
Hairy Woodpecker	4, 5, 6	3	69.0	2	60.0	-13.0
Goldfinch	7, 8	2	13.0	3	12.6	- 3.1
Bronzed Grackle	4	2	129.0	2	98.9	-23.3
Flicker	6	2	137.6	2	131.0	- 4.8
Starling	3, 5, 6, 12	1	81.2	2	77.8	- 4.2
<i>Group C—Females significantly heavier than males</i>						
Catbird	5, 6, 7	23	34.1	34	36.5	+ 7.0
House Wren	5, 6, 7, 8	29	10.8	16	11.4	+ 5.6
Bob-white	5, 6, 7, 8	4	174.2	2	186.8	+ 7.2
Robin	4, 5, 8, 10	2	73.9	2	79.4	+ 7.4

Cardinals to be heavier than females. These authors' data are not strictly comparable to ours, as they did not consider monthly differences in comparing the weights of the two sexes, but nevertheless more data are required for many of these species.

AGE DIFFERENCES IN WEIGHT

The data showing the age differences in the weight of birds were compiled in a similar manner as in showing the sex differences of the adults. Averages were made for adults and immatures only for those months when

TABLE 4
Age Differences in the Weight of Birds

Species	Months	Adult		Immature					
		Records per month	Average weight grams	Records per month	Average weight grams	Percentage different from adults			
<i>Group A—Both sexes of adults and immatures of approximately same weight</i>									
Chipping Sparrow	6, 7, 8, 9	114	12.1	113	12.0	— 0.8			
Downy Woodpecker	7, 8	18	25.7	10	25.4	— 1.2			
Cardinal	7, 8, 9	8	40.3	10	40.9	+ 1.5			
<i>Group B—Adult sexes the same and immatures less in weight</i>									
White-throated Sparrow ¹	10	151	26.3	233	25.5	— 3.0			
White-crowned Sparrow ¹	10	128	29.7	93	28.6	— 3.7			
Field Sparrow	8	14	13.1	113	12.4	— 5.5			
English Sparrow	6, 7, 8, 9	8	27.5	118	26.6	— 3.3			
Slate-colored Junco ¹	10	27	20.0	14	18.4	— 8.0			
Towhee	7, 8, 9	18	40.5	22	38.4	— 5.2			
White-breasted Nuthatch	6, 7	8	21.0	5	19.4	— 7.6			
Species	Months	Adult Male		Adult Female		Immature			
		Rec. per mo.	Avg. weight grams	Rec. per mo.	Avg. weight grams	Rec. per mo.	Avg. weight grams	% different from adult	
							♂	♀	
<i>Group C—Sexes of adults differ and immatures of less weight</i>									
Song Sparrow	6, 7, 8, 9	50	21.4	39	20.4	576	19.8	— 7.5	— 2.9
Cowbird	6, 7	5	46.4	20	39.4	124	37.6	—19.0	— 4.6
House Wren	7, 8	27	10.8	11	11.3	26	10.2	— 5.6	— 9.3
Brown Thrasher	6, 7	3	68.4	18	65.0	26	61.6	— 9.9	— 5.2
Mourning Dove	6, 7, 8, 9	10	137.7	4	130.0	9	103.4	—24.9	—20.5
Flicker	6	2	137.6	2	131.0	1	75.2	—45.3	—42.6
Robin	8	1	73.1	1	80.0	2	71.2	— 2.6	—11.0
<i>Group D—Sexes of adults differ and immatures of greater weight</i>									
Catbird	6, 7	23	33.4	30	35.5	40	36.7	+ 9.9	+ 3.4

¹ Adult sexes not distinguished.

sufficient records of both were available. The monthly averages were then in turn averaged to give the figures in Table 4. Immature birds are considered to be those that have left the nest and are living more or less independently of their parents. No study is here made of the weight increase during the growth period of young birds in the nest.

In nearly all instances immature birds weigh less than do the adults. Even in the Catbird where the data indicate that during June and July the immatures weigh more than the adults, some further information (Table 5) shows that during August and September the immatures weigh less than the adults at that time. Wetherbee (1934) also found immature Catbirds during the latter half of July and during August to weigh less than the adults. Her immature Chipping Sparrows, on the other hand, weighed 4.3 per cent less than the adults and her immature and adult Field Sparrows weighed nearly the same, results that do not harmonize with ours. She and also Stewart (1937) found immature and adult White-throated Sparrows to weigh practically the same. Stewart also found immature Chipping Sparrows to weigh 3.5 per cent less than the adults, while immature Field Sparrows weighed 6.0 per cent more. This lack of consistency in results may indicate either a faulty method of analysis or an inadequate amount of data, or both.

HOURLY VARIATION IN WEIGHT

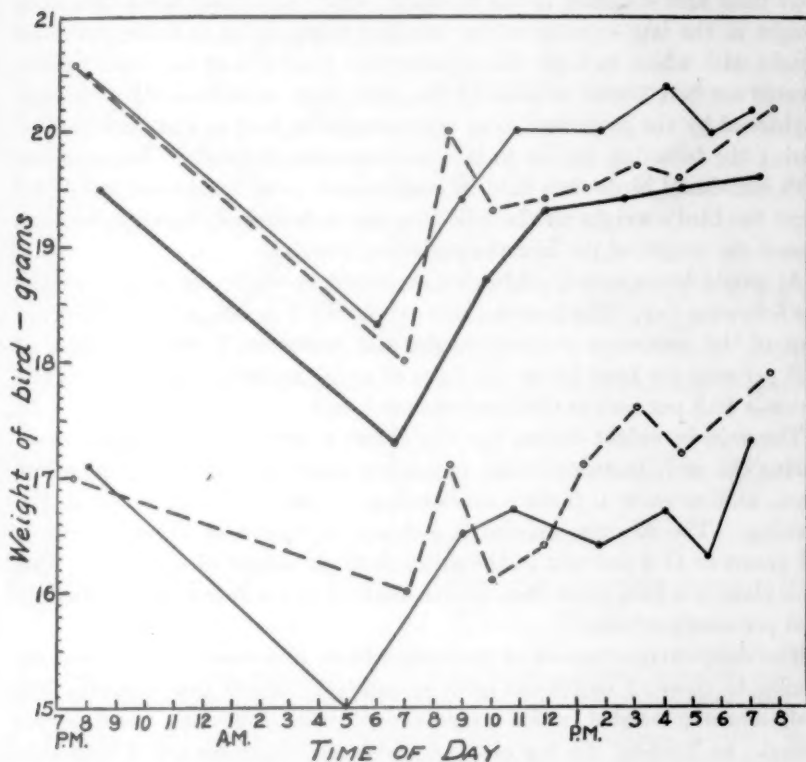
That birds vary in their weight at different hours of the day has long been supposed, although actual quantitative study of such variation is not great. Taber (1928) and Nice (1929) determined that Mourning Doves lost in weight during twelve hours at night an amount equal to between 8 and 9 per cent of their early-morning weight, and Taber found for miscellaneous records of fifteen species this loss to average 7.7 per cent. Weight lost at night must be regained during the day, so this represents a method of determining maximum daily weight fluctuations.

Sumner (1935) determined that the California Quail (*Lophortyx californica*) lost between 6.2 and 9.8 per cent under similar conditions. Stewart (1937) states that an overnight weight loss of about 10 per cent is sustained in the smaller birds but this becomes less in larger birds, being 5 per cent in the Bob-white. Kendeigh (1934) studied weight losses of birds in darkness without food and noted considerable effect of activity, temperature, light, relative humidity, wind, season, and other influences. During twelve hours at an air temperature of 70° F. (21.1° C.), English Sparrows lost approximately 10 per cent and House Wrens 14 per cent of their initial weight.

Partin (1933) obtained over a thousand weights of 800 House Finches (*Carpodacus mexicanus frontalis*) throughout the year. These, when summarized, show an increase in weight during the day and the maximum

reached sometime during the afternoon. The average daily increase in adults he states to be 3.5 per cent and in immatures 5.0 per cent, but minimum morning weights before feeding were not obtained.

Linsdale and Sumner (1934a) studied hourly variations during the day in the weight of Golden-crowned Sparrows (*Zonotrichia coronata*) and found that birds of this species tend to be heaviest in late afternoon, but almost as often reach their greatest daily weight about midday. The birds



TEXT-FIG. 1.—Fluctuations in weight of immature Song Sparrows kept overnight in small cages and given food after first weighing the following day.

increased about 4 per cent in weight from 8.00 o'clock a.m. to 6 o'clock p.m. Other studies by these authors (1934b, 1937) show similar variations in Fox Sparrows and Spotted Towhees (*Pipilo maculatus falcifer*).

In a study of 730 weights of Song Sparrows, Mrs. Nice (1937) also finds that an increase in weight takes place in both male and female toward noon and especially during late afternoon, amounting to somewhat less than 5 per cent. In a study of other species, she (1938) found daily weight

increases up to 10.8 per cent. Stewart (1937) finds a morning to evening rise in weight but with a slight mid-day smoothing or even slumping in the curve of increase.

The hourly variation in the weight of birds during the 24-hour day was studied in the present investigation under both controlled and natural conditions. Text-fig. 1 shows the variation in the weight of captive juvenal Song Sparrows kept in small cages without food overnight and given food after their first weighing in the morning. Only birds were used that were caught in the late evening at the banding traps, so as to have a normal weight with which to begin the experiment. Only five of the more typical records are here shown as some of the other birds experimented with were frightened by the procedure so as not to consume food in a normal fashion during the following day or to increase normally in weight. Experiments with individual birds thus held in confinement were considered successful when the bird's weight on the following day approached, equalled, or surpassed the weight of the bird the preceding evening.

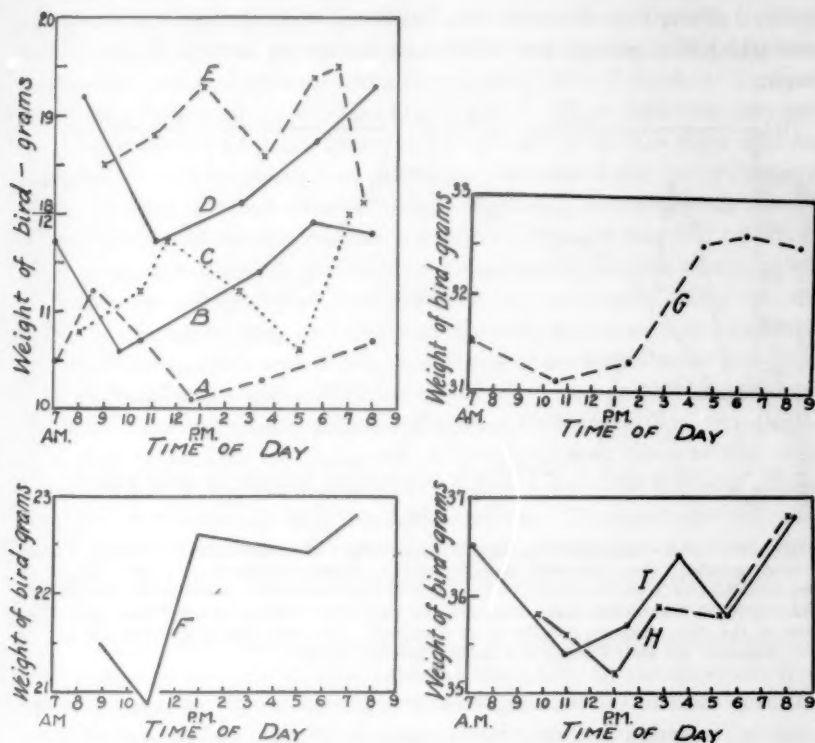
As would be expected, all birds lost weight at night and gained weight the following day. The loss at night averaged 1.9 grams, which is 10.0 per cent of the maximum evening weight and represents a loss overnight of 0.95 per cent per hour (or on the basis of mean daylight weight the night's loss was 10.3 per cent or 0.98 per cent per hour).

The gain in weight during the day shows a tendency to be more rapid during the early morning hours, to become more gradual during the afternoon, and to show a further acceleration, at least in some cases, in the evening. The average maximum increase in weight in these records is 2.2 grams or 11.9 per cent of the mean daylight weight of the birds. This took place in a little more than twelve hours or at the rate of approximately 0.95 per cent per hour.

The daily weight curves of individual birds in a free natural state are similar to those of individual birds in captivity except that the very low early-morning weights, which would occur around 5.00 a.m., were not obtained. In Text-fig. 2 a few of these curves are shown for individuals that repeated in the traps several times during the same day. The tendency is for the heavier weights to occur in the afternoon, but there is considerable fluctuation from hour to hour. Several records show a drop in weight toward the middle of the day.

In order to ascertain the general trend in variations of weight during the day of the bird population as a whole, averages of all weights each hour were computed for each species, age, and month during the summer. No distinction was here made between sexes since both males and females possessed a daily rhythm and records on both sexes were fairly evenly distributed. The weight of the adult birds each hour was then put into terms of per-

centage of the mean daylight weight of the species and all species were averaged together, combining the three summer months of June, July and August, to give the smoothed curve shown in Text-fig. 3. Species entering

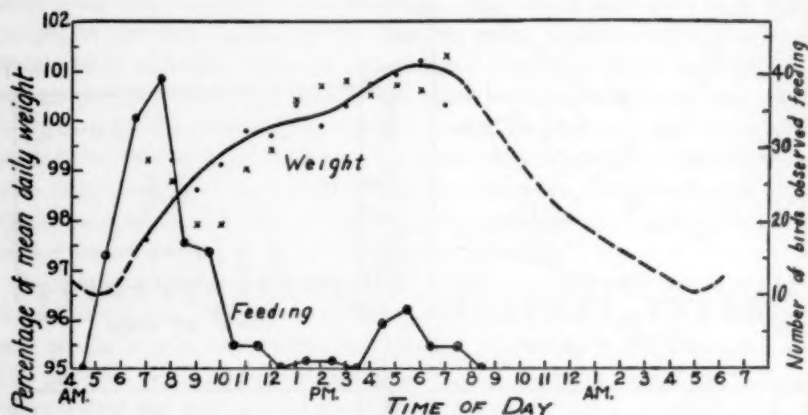


TEXT-FIG. 2.—Hourly fluctuations in weight of individual birds on single days while living freely in the natural wild state. A—Chipping Sparrow, F-45368, immature, July 31, 1931; B—Chipping Sparrow, F-45368, immature, July 25, 1931; C—Chipping Sparrow, C-68760, female, June 24, 1930; D—Song Sparrow, B-165841, female (?), July 11, 1932; E—Song Sparrow, B-189226, female (?), April 27, 1932; F—Song Sparrow, B-189217, male (?), April 27, 1932; G—Cowbird, A-288170, immature, July 14, 1933; H—Cowbird, A-288173, immature, July 22, 1933; I—the same, July 15, 1933.

into this composite curve are Chipping Sparrow, Song Sparrow, Field Sparrow, English Sparrow, Catbird, Cowbird, House Wren, and Mourning Dove. The curve is extended on a hypothetical basis to include the rest of the day as well.

At night the curve is drawn to show the drop in weight somewhat more rapid early in the evening than later. This is surmised from the fact that the birds are more restless then than they are later during the night, and there is elimination of undigested food material from the alimentary tract.

After an hour or so when the birds have settled down, the metabolic rate and body temperature may become reduced to the standard level as the birds attain a post-absorptive condition, and the weight loss is probably uniform. Birds are even more quiet after midnight than before, which implies a slower rate of weight loss, but this is offset by lower air temperatures which then prevail and which may induce an increase in the loss of weight.



TEXT-FIG. 3.—Average daily rhythm in body weight of several species of birds during summer months. Dots represent data for adults; crosses represent data for immatures; the heavy full line is the smoothed curve drawn through these data for adults; the broken line is interpolated to indicate approximately how the birds' weight varies during the other hours of the day when no weights were obtained. The thin line represents number of birds observed per hour feeding in a natural habitat (Long).

During most of the morning there is a gradual weight increase due, apparently, to active feeding. From about 11.00 a.m. to 3.00 p.m. the increase in body weight becomes small, probably due to the less active feeding. In late afternoon there is again an acceleration of weight increase which may be correlated again with the more active feeding. The general similarity between this curve and many of the curves shown in Text-figs. 1 and 2 is apparent, although here many of the fluctuations characteristic of individual birds for individual days are eliminated.

The curve in Text-fig. 3 showing the amount of feeding throughout the day was kindly furnished by Mr. William H. Long, and is the result of intensive study of bird activities under natural conditions out-of-doors, made when he was engaged in the Williamston Wildlife Management Project, School of Forestry and Conservation, University of Michigan. The curve summarizes records of 422 individuals of forty-one mostly passerine species during July, 1931, on an area of ungrazed farmland. The correlation between the curves in this figure is most significant since they were made by

different workers in different localities independently of one another and combined in the same chart without further modification. Flentge (1937) has also attempted recently to learn the principal times of day for feeding from the number of birds captured in banding traps. When his data are put on an hourly basis, they agree well with the curve in Text-fig. 3 except that he found a relatively larger number of birds coming to the traps between 5.00 p.m. and darkness than at any other time of the day. In Text-fig. 3, data for immature birds are also inserted. These data were prepared as for the adults; they are averages for all species for the three summer months. It will be noted that all points fall around the curve for adult birds, although there are some differences which may prove to be significant.

The time at which the maximum weight is attained may fall on almost any hour in the afternoon although in the composite curve it comes at 6.00 o'clock in the adults and at 7.00 o'clock in the immatures. This was well shown in a separate study of the average daily rhythm of each species during all months where data were available and also of similar data for Tree Sparrow, Slate-colored Junco, White-crowned Sparrow, and White-throated Sparrow. The maximum weight came most frequently (five times) at 7 p.m., four times each at 8 p.m. and 4 p.m., and nine times at five other hours. Late afternoon and evening, therefore, seem to be the most typical time for birds to attain their maximum weight. The minimum weight is probably attained soon after the birds begin activities in the very early morning and before they have begun to fill their stomachs with food. In the summer, this would be at some time around 5 a.m. Such actual minimum weights were probably not obtained in this study, although random fluctuations to very low weights occurred irregularly at various hours later in the morning.

The difference between the extreme values for adults shown in Text-fig. 3 is approximately 4.5 per cent, if the interpolated value for 5.00 o'clock a.m. is used, or 3.5 per cent if the value at 7.00 o'clock is considered the minimum. This agrees well with weight variations of birds in the wild found by other workers but, nevertheless, does not represent the extent of variation in the weight of individual birds for single days. Using a table of data, not incorporated in this paper, giving the average daily rhythm in weight of each of the above species for many months of the year, a preliminary study of the supposed maximum daily weight variation showed an interesting statistical phenomenon. Nine sets of data each with an average of less than ten weights per hour had an average extreme weight variation during the day of 13.4 per cent; six sets of data each with from ten to seventeen weights per hour had an average variation of 11.6 per cent; four sets of data with from twenty to twenty-six weights per hour had 7.2 per cent maximum variation; while two sets of data with sixty-four and eighty weights per hour showed

only 4.1 and 4.9 per cent variations, respectively. The more numerous the data, the less the maximum percentage variation became. One reason for this is that the hour at which the minimum and maximum weights, especially the maximum weights, were attained varied so greatly on different days and with different individuals that when all weights for each hour for many individuals were averaged, true maximum and minimum values were lost. This was further shown from a study of weight variations during the day of individual birds that came to the traps and were weighed at least once in the morning and once in the afternoon. In a total of 655 days' records for eighteen passerine species, the greatest weight came in the afternoon on 65 per cent of the days, while on the other 35 per cent of the days, the greatest weight came some time in the morning. The random manner in which the weight of birds in Nature may fluctuate is shown in Text-fig. 2, yet if the birds' weight were continuously recorded, one would probably find a greater percentage of the maximum weights coming in the afternoon. Thus, the average of scattered weights of many individuals over many days tends to eliminate extreme values and does not show the true extent to which an individual bird may vary.

An attempt was then made to determine the extreme variation in weights of individual birds only for the more typical cases where their maximum weights came in the afternoon. With 252 different individual birds belonging to seventeen species and covering 429 days, this variation in percentage of their mean weight amounted to 5.4 ± 0.36 per cent. Even this is not as great as it should be because in most cases only two or three weights of a bird were available for single days and so the truly extreme weights for the day were probably measured in only a very small percentage of the cases. Nevertheless, this 5.4 per cent of variation approaches the 5.9 per cent variation between the extreme weights of the birds shown in Text-fig. 1, if the first early-morning weight before feeding commences is omitted. Probably in very few instances, if any, were truly minimum weights, such as occur early in the morning, measured with birds caught in the traps. It seems not unlikely that, if these could be obtained, extreme variations of from 8 to 12 per cent as noted by ourselves and by Taber (1928), Nice (1929), Sumner (1935), and Stewart (1937) in experimental birds would not be out of harmony with what frequently occurs in wild birds living freely in Nature. One may expect, however, that the extent of the daily fluctuation in weight may vary under different environmental circumstances, especially, as will be later shown, with air temperature.

MONTHLY VARIATIONS IN WEIGHT

More literature is available on monthly variations during the year in weight of birds than on hourly variations during the day. Wilson (1911,

vide Stresemann, 1927) gives a yearly curve for a grouse, *Lagopus scoticus*, which is somewhat irregular. The male showed highest weights from December to February and again in August, with lowest weights occurring in March and again in September and October. The female generally increased in weight from November to April and decreased from April to November. Stieve (1922) found that captive geese decreased about 25 per cent as the gonads matured during the breeding season. Zedlitz (1926) made an intensive study of monthly variations in the weight of several species of European birds. With few exceptions, all species weighed most in winter and early spring, decreased during the breeding season, and then increased during the following autumn. Weigold (1926) adds confirmatory records.

Song Sparrows that winter in an area or migrate through it early in the spring have been noted by several observers to be heavier than those that breed in the same region in the summer (Whittle, 1927, 1929; Myers, 1928; Hoffman, 1930; Wetherbee, 1934; Nice, 1934). Nice (1937) shows that Song Sparrows are somewhat low in autumn, reach their maximum in late December, January, and early February, gradually decrease to April and from then on (except for laying females) decrease to a lower point than in autumn. Males in January weighed 11 per cent higher than in April, females 7.5 per cent higher. Recently (1938) she has shown winter increases in weight for other species. Stewart (1937) obtained 215 weights of Song Sparrows between August and April. The birds' weight increased regularly from August to a maximum in January, then decreased to April. With the Scaled Quail (*Callipepla squamata*) in New Mexico, Russell (1931) reports maximum weights in February and minimum weights in August. No data are available for the months, November to January. In captive male *Fringilla coelebs*, Groebbels (1932) found minimum weights to occur in January and an increase to a maximum in March, April and May. Contrary results were obtained with captive male *Phoenicurus phoenicurus* and *Turdus merula*, for with these species, greatest weights came in the winter, while during March, April, and May, there was a decided drop in weight with the onset of singing. During the summer months weights again increased. Weight variations in captive birds may often require special explanation and may often not represent conditions in the wild. With *Sylvia communis* not in captivity, he found a decrease in weight from middle March to middle May, a maintenance of low weight during the summer, and an increase again in the autumn. Hicks (1934) found that the weight of male and female Starlings increased during the winter from December to early February, when the maximum was reached, then decreased through March. Kendeigh (1934) showed that winter weights of English Sparrows were greater than summer weights.

Linsdale and Sumner (1934b) found in a large number of weighings of the Golden-crowned Sparrow and the Fox Sparrow an increase in weight from October until a peak was reached in mid-winter (about January) and that another even higher peak was reached in May just before the spring migration. Supplementary information indicated that this weight was maintained until arrival on the breeding grounds. Some evidence indicated a decrease in weight during midsummer. In a later study of Spotted Towhees, Linsdale and Sumner (1937) found somewhat similar monthly variations in weight on the basis of more fragmentary data, although they state that male towhees did not show a peak in weight just before migration in the spring as did the two other species with which they worked.

Heydweiller (1935a, b) studied weights of Tree Sparrows on their wintering grounds around Ithaca, New York, and on their breeding grounds around Churchill, Manitoba. Maximum weights of males (21.2 grams) and females (20.2 grams) were attained during the first week of March. In late March and April a decrease of 10 per cent in their weights occurred. On the breeding grounds in July and early August, both males and females decreased still further in weight to a minimum of 82 per cent of their maximum spring weight. During the third week of August the adults began to increase in weight. Only nine weights were taken in August and the number available for other months is not given.

Shaw (1935) in China, analyzed 287 weights of the Tree Sparrow, *Passer montanus saturatus*, and came to the conclusion that seasonal variation of body weight was very slight. However, a study of his table of average monthly weights of males and females discloses that the weights of the species during March, April, and May are predominantly above the average and during June, July, and August below the average.

In Sumner's (1935) study of the California Quail, weight curves are given showing monthly variations separately in male and female. The males weighed the most from December to March and the least from late April to July. The female's weight was high from December on through the winter but did not reach its maximum until May, while it was lowest from July to November, thus lagging behind the male in its variations.

Stoner (1936) gives information on the weight of the Bank Swallow (*Riparia r. riparia*), indicating a progressive decrease from May to June to July.

That the size or weight of birds varies during different portions of the spring and autumn migration periods is known. Allen (1871) stated long ago: "In the Anatidae and *Tringa*, which breed far to the northward and pass the winter in lower latitudes, it is noticeable that, those which arrive first in the fall, and those which return north latest in the spring, are smaller than those that arrive later and depart earlier, . . . This has been

especially noticed in species of *Fulix*, *Bernicla*, *Actodromas*, and *Macrorhamphus*." Recent studies of Kendeigh (1934) show similar relations between times of migration and weights of White-crowned and White-throated Sparrows. Wetherbee (1934) also found that Myrtle Warblers (*Dendroica coronata*) migrating late in the autumn are heavier than those individuals migrating earlier. In general, the evidence from the literature indicates that, with some exceptions, birds tend to weigh most during the winter or spring and least during the summer or early autumn. The exact time at which the minimum and maximum weights are attained may vary with the sex and the species, and presumably may also be influenced by differences in environmental conditions due to locality and by breeding factors. A great variety of reasons is given in explanation of these hourly and monthly changes in bird weight although there is very little detailed analysis or experimental verification. The increase in weight during the daytime and the decrease at night are generally explained by the consumption of food (and water) during the daytime and its utilization without replacement at night. The extent of the daily fluctuation in weight would be correlated, apparently, with the capacity of the digestive tract to hold food.

Monthly changes in the weights of a species are sometimes believed to be due to variations in the individuals or to the proportion of immatures and adults composing the bird population (Hicks, 1934). Such variations in the population of a species at different times of the year do occur (Starling), especially during migration, and may in some cases explain the changes noted in the weight of the species. In at least some instances (Song Sparrow) these weight differences have been correlated with size differences in the different individuals involved (Wetherbee, 1934). Numerous records obtained by Linsdale and Sumner (1934b), Nice (1937), and Stewart (1937) of weights of the same individual banded birds at various times of the year show variations similar to those of the species as a whole; these monthly variations in weight are, therefore, not everywhere to be explained merely by the shifting constitution of the population of the species. Likewise, the increasing weights obtained for the species during the autumn and winter cannot be due simply to the increasing age of the younger birds, for they hold true for adults, taken separately, as well. In some passerine species immature birds closely approximate the adults in weight within two or three months or by early autumn (Linsdale, 1928; Partin, 1933; Shaw, 1935; Nice, 1937). The decrease in weight during the spring or summer is obviously not due simply to increasing age of the immatures in the population even if the increase in weight during the autumn could be thus explained.

Variation in the abundance of food, or, at least, variation in the amount of feeding, is mentioned incidentally by many authors as the cause of weight fluctuations. The drop in weight during the late spring and summer is

ascribed to the irregular feeding of the birds at that time because of the greater activity involved in singing, in caring for the young, and of the long periods of sitting on the eggs during incubation. During other seasons, a part or all of this time may be devoted to feeding. Some correlation has also been attempted with length of day and amount of activity. Some think a drop in weight may be caused by a high nervous excitement involved in mating and nesting, as well as by the actual energy requirements for spermatogenesis and oogenesis, for increase in size of the gonads, for molting and renewal of feathers, and for the act of migration. The energy requirements and the energy production of birds at different seasons of the year have never been satisfactorily measured in full. In Kendeigh and Baldwin's (1937) analysis of the factors affecting the abundance and distribution of the House Wren, it was shown that breeding does require a certain amount of energy over and above that necessary merely for existence, but this was compensated for, in part at least, by the distribution during the breeding season being limited to more moderate climatic regions than during other periods of the year. The possibility distinctly exists that excess needs at one season, as for nesting or molting, are balanced by other needs at other seasons, as for migration, or, in winter, for increased resistance to lower temperatures and longer nights. The suggestion that birds, by becoming fat at certain seasons, unconsciously foresee migration or breeding or wintering conditions of any other energy requirement seems unjustified. More probably the functions of birds respond to forces acting at the moment or in the past.

Fluctuations in bird weights may be correlated with amount of feeding or with rates of energy utilization or with both together. There still remains the question as to which are causes and which are effects, or whether variations in weight, feeding, and energy utilization are dependent upon some other factor not yet mentioned. Some suggest as a factor the existence in the bird of internal physiological rhythms involving glandular changes, ratio between anabolism and katabolism, or other conditions. Bird students in California have found, for instance, that the females of certain species (Fox Sparrow, Shrike, House Finch, California Quail) are heavier in relation to the male during the early breeding period than they are at other times (Linsdale, 1928; Miller, 1931; Partin, 1933; Sumner, 1935). This has been shown also for the Scaled Quail (Russell, 1931) and Song Sparrow (Nice, 1937). In experimental work with captive male geese on the other hand, Stieve (1922) found that the gonads did not develop normally without a corresponding decrease in body weight. Seasonal changes in weight may possibly be correlated also with changes in size and rate of functioning of such internal organs as liver, spleen, and thyroid (Riddle, 1928), or with length of digestive tract or other organs.

Monthly averages of body weight were obtained in this study for several species of birds available from the banding traps. These are presented in Table 5. Averages are presented for each sex separately, for adults regardless of sex, occasionally an average of the weights of the two adult sexes, for immatures, occasionally for all individuals of a species regardless of sex and age, and separately for those whose age and sex were unknown. Usually adults and immatures are not separated after October but all individuals classed as adults. The total number of records for adult birds is frequently more than the combined records given separately for the sexes because many adults were not sexed when weighed. Since records were obtained with fair uniformity in both forenoon and afternoon during all seasons, the daily-rhythm factor is largely eliminated.

In the analysis of the records, major emphasis is placed on average weight of all the adults, since both sexes are included in the data for each month. Discrepancies between the sexes in monthly weight variations are worthy of note. For instance, there is some evidence that females differ from males by increasing in weight during the egg-laying period, as was noted in the literature above. As shown in Table 5, female Song Sparrows in May dropped in weight from what they were in April, although this drop was less than the drop in the males, and the females more nearly approached the males in weight during this month than at any other time. In June, the females dropped in weight considerably more than did the males. The female Chipping Sparrows appeared to increase in weight from April to June while the males were decreasing, yet the number of weights obtained during April is not sufficient to be entirely trustworthy. There seems also to be an increase in weight of female Cowbirds, Towhees, and Downy Woodpeckers during May which lends suspicion to the truth of this hypothesis. Yet considerably more data are required before the possibility can be eliminated that the variations may be due to random sampling or to other causes. Variation in the monthly average weight of males also occurs, which, if substantiated by more information, likewise needs to be explained. Differences between sexes in monthly variations are of less concern in the present investigation than are the broad general trends throughout the year that seem best represented by combining the weights for both sexes.

Considering all the data for adult birds in Table 5, an analysis shows that the lowest weight comes in July for nine species, in August for five species, in June for four species and in other scattered months for another four species. Only in the White-breasted Nuthatch are the lowest weights found in winter. This species is peculiar in that its weight falls almost as low in July as in winter and averages higher in both spring and autumn. An average of all species clearly shows the minimum weight in July.

In general, the weights increase month by month until mid-winter, then

TABLE 5
Monthly Record of the Weights of Wild Birds, listed in the Order of Abundance of Data

Species	Age and Sex	January		February		March		April		May		June	
		Number Records	Average Weight	Number Records	Average Weight	Number Records	Average Weight	Number Records	Average Weight	Number Records	Average Weight	Number Records	Average Weight
Song Sparrow, <i>Melospiza melodia</i> ¹	M.	—	—	—	—	—	—	176	21.5	112	20.8	96	20.7
	F.	—	—	—	—	—	—	45	21.0	73	20.6	72	19.7
	Immn.	1	22.9	3	24.1	26	22.4	464	21.4	382	21.1	293	19.9
Chipping Sparrow, <i>Spizella passerina</i>	M.	—	—	—	—	—	—	34	12.7	406	12.2	133	12.1
	F.	—	—	—	—	—	—	14	11.9	248	12.2	128	12.2
	Immn.	—	—	—	—	—	—	237	12.6	1203	12.3	397	12.2
White-throated Sparrow, <i>Zonotrichia albicollis</i>	M.	—	—	—	—	—	—	—	—	—	—	16	12.7
	F.	—	—	—	—	—	—	—	—	—	—	—	—
	Immn.	—	—	—	—	—	—	16	28.7	90	29.4	—	—
Field Sparrow, <i>Spizella pusilla</i>	M.	—	—	—	—	—	—	—	—	—	—	—	—
	F.	—	—	—	—	—	—	24	12.8	44	12.5	3	13.4
	Immn.	—	—	—	—	—	—	157	12.9	205	12.8	4	12.8
Slate-colored Junco, <i>Junco hyemalis</i>	M.	—	—	—	—	—	—	54	21.4	—	—	—	—
	F.	—	—	—	—	—	—	63	19.9	—	—	—	—
	Immn.	1	19.6	8	22.6	19	21.0	366	21.0	—	—	—	—
English Sparrow, <i>Passer domesticus</i>	M.	34	29.9	19	28.6	6	29.7	1	26.5	1	27.0	4	27.2
	F.	33	28.2	20	28.3	6	29.0	2	30.0	3	28.1	3	28.1
	Immn.	72	29.1	40	28.5	18	29.5	6	29.3	1	27.0	7	27.6
Tree Sparrow, <i>Spizella arborea</i>	M.	—	—	—	—	—	—	—	—	—	—	—	—
	F.	—	—	—	—	—	—	—	—	—	—	—	—
	Immn.	8	20.1	29	21.6	79	19.6	346	19.3	—	—	—	—
Catbird, <i>Dumetella carolinensis</i>	M.	—	—	—	—	—	—	—	—	—	—	—	—
	F.	—	—	—	—	—	—	—	—	24	35.3	25	34.2
	Immn.	—	—	—	—	—	—	—	—	43	38.4	39	36.3
Cowbird, <i>Molothrus ater</i>	M.	—	—	—	—	—	—	—	—	139	36.4	116	35.4
	F.	—	—	—	—	—	—	—	—	—	—	5	38.5
	Avg.	—	—	—	—	—	—	14	45.5	10	47.4	5	47.7
	M.	—	—	—	—	—	—	15	37.5	19	38.6	28	39.8
	F.	—	—	—	—	—	—	—	—	—	—	—	—
	Immn.	—	—	—	—	—	—	—	—	—	—	36	38.5

¹ The American Ornithologists' Union 'Check-list,' fourth edition, 1931, is followed for the scientific names of the species. Subspecies are not considered in this report, since no attention was given to their identification and since the subspecific status of some local birds is uncertain. All weights were obtained from birds in the vicinity of Cleveland, Ohio.

TABLE 5—(Continued)
Monthly Record of the Weights of Wild Birds, listed in the Order of Abundance of Data

Species *	Age and sex	July			August			September			October			November			December		
		Number Records	Average Weight		Number Records	Average Weight		Number Records	Average Weight		Number Records	Average Weight		Number Records	Average Weight		Number Records	Average Weight	
White-crowned Sparrow, <i>Zonotrichia leucophrys</i>	Ads. Imm.	—	—	—	—	—	—	3	25.7	—	128	29.7	—	4	31.6	—	—	—	—
House Wren, <i>Troglodytes aedon</i>	M.	46	10.8	—	8	10.7	—	—	—	—	—	—	—	—	—	—	—	—	—
	F.	15	11.4	—	7	11.2	—	—	—	—	—	—	—	—	—	—	—	—	—
	Ads. Imm.	61 35	11.0 10.2	—	15 18	11.0 10.3	—	—	—	—	—	—	—	—	—	—	—	—	—
Towhee, <i>Pipilo erythrophthalmus</i>	M.	16	41.0	—	3	40.8	—	7	44.8	—	4	37.6	—	—	—	—	—	—	—
	F.	3	38.3	—	1	39.1	—	21	39.7	—	7	41.1	—	—	—	—	—	—	—
	Ads. Imm.	19 23	40.6 37.6	—	4 25	40.4 37.1	—	32 19	40.5 40.4	—	16 2	39.8 41.1	—	1	47.8	—	—	—	—
Mourning Dove, <i>Zenaidura macroura</i>	M.	20	131.6	—	2	143.0	—	3	138.5	—	—	—	—	—	—	—	—	—	—
	F.	27	125.3	—	2	130.6	—	1	119.6	—	—	—	—	—	—	—	—	—	—
	Ads. Imm.	27 15	130.0 105.1	—	8 4	141.2 109.6	—	7 2	122.0 105.9	—	—	—	—	—	—	—	—	—	—
Downy Woodpecker, <i>Dryobates pubescens</i>	M.	10	25.1	—	5	26.1	—	8	26.5	—	2	26.4	—	—	—	—	—	—	—
	F.	15	24.2	—	4	27.3	—	5	26.3	—	—	—	—	—	—	—	—	—	—
	Ads. Imm.	25 4	24.6 24.6	—	9 15	26.6 25.9	—	13 1	26.4 25.4	—	2	26.4	—	1	28.8 28.8	—	—	—	—
Black-capped Chickadee, <i>Parus atricapillus</i>	M.	1	11.9	—	3	12.8	—	2	10.1	—	—	—	—	—	—	—	—	—	—
	F.	—	—	—	1	9.8	—	—	—	—	1	10.2	—	—	—	—	—	—	—
	Ads. Imm.	2 13	11.0 9.9	—	6 2	11.3 11.9	—	3 —	10.5 —	—	3 —	10.5 —	—	1	11.0	—	2	11.5	—
Cardinal, <i>Richmondia cardinalis</i>	M.	4	40.4	—	3	42.6	—	4	41.2	—	15	44.6	—	3	44.1	—	—	—	—
	F.	6	40.6	—	7	37.9	—	1	40.7	—	4	42.8	—	1	45.1	—	—	—	—
	Ads. Imm.	10 9	40.5 39.4	—	10 7	39.4 40.8	—	5 24	41.1 42.4	—	19 7	44.2 44.3	—	4	44.4	—	2	45.4	—
Brown Thrasher, <i>Toxostoma rufum</i>	M.	1	71.9	—	—	—	—	1	76.4	—	—	—	—	—	—	—	—	—	—
	F.	10	68.1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
	Ads. Imm.	13 34	69.1 59.7	—	1 —	60.0 —	—	3 1	71.1 68.1	—	—	—	—	—	—	—	—	—	—
White-breasted Nuthatch, <i>Sitta carolinensis</i>	M.	8	21.1	—	1	19.8	—	—	—	—	—	—	—	—	—	—	—	—	—
	F.	8	20.5	—	4	21.3	—	—	—	—	—	—	—	—	—	—	—	—	—
	Ads. Imm.	17 7	20.9 20.4	—	5 4	21.0 22.6	—	3 1	22.0 21.8	—	1 —	22.0 —	—	—	—	—	2	20.6	—

TABLE 5—(Continued)
Monthly Record of the Weights of Wild Birds, listed in the Order of Abundance of Data

Species	Age and Sex	January		February		March		April		May		June	
		Number	Average Weight	Number	Average Weight	Number	Average Weight	Number	Average Weight	Number	Average Weight	Number	Average Weight
Tufted Titmouse, <i>Baeolophus bicolor</i>	M.	—	—	—	—	—	—	7	20.7	—	—	6	21.4
	F.	6	22.4	4	23.6	2	22.0	7	20.7	5	22.4	7	21.2
	Imm.	—	—	—	—	—	—	—	—	—	—	2	19.6
Robin, <i>Turdus migratorius</i>	M.	—	—	—	—	—	—	2	73.9	3	79.6	3	81.4
	F.	—	—	—	—	—	—	1	82.8	1	77.2	—	—
	Imm.	—	—	—	—	5	77.4	3	76.9	4	79.0	4	78.6
Blue Jay, <i>Cyanocitta cristata</i>	M.	—	—	—	—	—	—	—	—	—	—	1	87.1
	F.	—	—	—	—	—	—	1	83.8	7	86.1	33	76.8
	Imm.	1	95.0	—	—	—	—	4	80.8	8	86.5	42	77.5
Bob-white, <i>Colinus virginianus</i>	M.	—	—	—	—	—	—	—	—	—	—	—	—
	F.	—	—	—	—	—	—	3	196.8	1	171.4	1	184.3
	Imm.	—	—	—	—	—	—	4	189.8	2	186.2	1	184.3
Starling, <i>Sturnus vulgaris</i>	M.	—	—	—	—	—	—	—	—	—	—	—	—
	F.	—	—	—	—	2	85.6	—	—	1	77.6	1	81.3
	Imm.	—	—	2	80.8	6	86.2	—	—	1	73.0	2	78.6
Vesper Sparrow, <i>Poocetes gramineus</i>	M.	—	—	—	—	—	—	—	—	—	—	—	—
	F.	—	—	—	—	—	—	—	—	—	—	—	—
	Imm.	—	—	—	—	—	—	2	27.6	3	25.2	—	—
Bluebird, <i>Sialia sialis</i>	M.	—	—	—	—	—	—	—	—	—	—	1	24.6
	F.	—	—	—	—	—	—	10	33.8	3	33.7	2	30.2
	Imm.	—	—	—	—	—	—	—	—	—	—	2	29.6
Hairy Woodpecker, <i>Dryobates villosus</i>	M.	—	—	—	—	—	—	3	68.0	5	70.3	2	68.6
	F.	—	—	—	—	—	—	1	63.1	2	59.2	2	57.8
	Imm.	—	—	1	61.6	—	62.4	—	65.6	—	64.8	—	63.2
Goldfinch, <i>Spinus tristis</i>	M.	—	—	—	—	—	—	—	—	—	—	—	—
	F.	—	—	—	—	—	—	—	—	—	—	—	—
	Imm.	—	—	—	—	—	—	—	—	2	11.3	—	—
Fox Sparrow, <i>Passerella iliaca</i>	M.	—	—	—	—	—	—	—	—	—	—	—	—
	F.	—	—	—	—	—	—	—	—	—	—	—	—
	All	—	—	—	—	—	—	9	36.6	—	—	—	—

TABLE 5—(Continued)
Monthly Record of the Weights of Wild Birds, listed in the Order of Abundance of Data

Species	Age and Sex	July		August		September		October		November		December	
		Number Records	Average Weight	Number Records	Average Weight	Number Records	Average Weight	Number Records	Average Weight	Number Records	Average Weight	Number Records	Average Weight
Tufted Titmouse, <i>Parus bicolor</i>	M.	2	22.6	—	—	1	21.8	1	23.7	—	—	—	—
	F.	1	20.5	2	19.8	1	21.8	1	23.7	—	—	6	23.4
	Ads.	4	21.8	2	19.8	3	19.1	1	23.7	—	—	—	—
	Imm.	13	20.0	3	18.7	0	20.2	—	—	—	—	—	—
Robin, <i>Turdus migratorius</i>	M.	1	71.0	1	73.1	4	85.4	1	69.0	—	—	—	—
	F.	3	72.5	1	80.0	—	—	4	77.4	—	—	—	—
	Ads.	18	68.3	2	76.6	4	85.4	5	75.7	—	—	—	—
	Imm.	—	—	2	71.2	1	61.1	3	77.2	—	—	—	—
Blue Jay, <i>Cyanocitta cristata</i>	M.	5	77.2	1	85.3	—	—	—	—	—	—	—	—
	F.	5	77.2	1	85.3	—	—	—	—	—	—	—	—
	Ads.	2	75.0	1	91.0	1	79.6	—	—	—	—	—	—
	Imm.	—	—	—	—	—	—	—	—	—	—	—	—
Bob-white, <i>Colinus virginianus</i>	M.	13	172.8	1	168.5	—	—	—	—	—	—	—	—
	F.	6	197.5	2	169.3	—	—	—	—	—	—	—	—
	Ads.	19	180.6	3	169.1	—	—	1	196.0	—	—	—	—
	Imm.	—	—	—	—	—	—	—	—	—	—	1	80.1
Starling, <i>Sturnus vulgaris</i>	M.	—	—	—	—	—	—	—	—	—	—	1	76.1
	F.	—	—	—	—	—	—	—	—	—	—	3	79.3
	Ads.	—	—	—	—	—	—	—	—	—	—	—	—
	Imm.	1	72.6	—	—	—	—	1	80.8	—	—	—	—
Vesper Sparrow, <i>Poocetes gramineus</i>	M.	10	22.9	1	23.1	1	23.3	2	24.8	—	—	—	—
	F.	—	—	—	—	—	23.0	—	—	—	—	—	—
	Ads.	—	—	—	—	—	—	—	—	—	—	—	—
	Imm.	—	—	—	—	—	—	—	—	—	—	—	—
Bluebird, <i>Sialia sialis</i>	M.	1	35.1	2	29.4	1	33.1	—	—	—	—	—	—
	F.	—	—	—	—	—	—	—	—	—	—	—	—
	Ads.	—	—	—	—	—	—	—	—	—	—	—	—
	Imm.	—	—	—	—	—	—	—	—	—	—	—	—
Hairy Woodpecker, <i>Dryobates villosus</i>	M.	—	—	1	69.5	—	—	—	—	—	—	—	—
	F.	—	—	—	—	—	—	—	—	—	—	—	—
	Ads.	—	—	—	—	—	—	—	—	—	—	—	—
	Imm.	2	61.8	—	—	—	—	—	—	—	—	—	—
Goldfinch, <i>Spinus tristis</i>	M.	2	12.8	1	13.3	3	11.8	—	—	—	—	—	—
	F.	2	12.2	4	13.0	5	11.8	—	—	—	—	—	—
	Ads.	—	—	—	—	—	—	—	—	—	—	—	—
	Imm.	—	—	—	—	—	—	—	—	—	—	—	—
Fox Sparrow, <i>Passerella iliaca</i>	All	—	—	—	—	—	—	5	34.7	4	38.2	—	—

TABLE 5—(Continued)
Miscellaneous Records (in A. O. U. Check-list Order)

Species	Month	Age and sex	Number of records	Average weight
Least Bittern, <i>Izobrychus exilis</i>	May	M.	1	64.8
Broad-winged Hawk, <i>Buteo platypterus</i>	May	M.	2	363.8
Sparrow Hawk, <i>Falco sparverius</i>	July	F.	1	113.5
Golden Plover, <i>Pluvialis dominica</i>	November	Imm.	1	136.2
Spotted Sandpiper, <i>Actitis macularia</i>	May	F.	1	40.4
Yellow-billed Cuckoo, <i>Coccyzus americanus</i>	August	M.	1	57.8
Screech Owl, <i>Otus asio</i>	September	Imm.	1	175.7
Ruby-throated Hummingbird, <i>Archilochus colubris</i>	May	M.	1	3.0
	July	M.	1	2.5
	August	?	1	3.2
	September	?	1	3.2
Belted Kingfisher, <i>Megasceryle alcyon</i>	September	?	2	133.4
Flicker, <i>Colaptes auratus</i>	May	M.	1	123.6
	June	M.	2	137.6
		F.	2	131.0
		Imm.	1	75.2
	July	Imm.	1	108.8
	August	?	1	109.7
	September	?	1	148.9
	October	?	1	130.1
Red-headed Woodpecker, <i>Melanerpes erythrocephalus</i>	May	M.	1	73.2
Crested Flycatcher, <i>Myiarchus crinitus</i>	July	F.	1	30.9
	August	?	1	28.7
Eastern Phoebe, <i>Sayornis phoebe</i>	May	F.	1	18.9
	June	M.	1	20.0
		F.	1	19.2
	August	F.	2	16.1
		Imm.	2	13.4
		?	6	17.5
	September	?	3	19.0
Yellow-bellied Flycatcher, <i>Empidonax flaviventris</i>	September	F.	1	11.8
Wood Pewee, <i>Myiochanes virens</i>	August	Imm.	1	13.0
		?	2	12.8
Purple Martin, <i>Progne subis</i>	July	F.	1	46.4
Crow, <i>Corvus brachyrhynchos</i>	June	M.	1	479.0
		Imm.	3	457.4
	July	Imm.	2	454.3
Red-breasted Nuthatch, <i>Sitta canadensis</i>	February	M.	1	11.8
Brown Creeper, <i>Certhia familiaris</i>	October	Imm.	2	8.8
Winter Wren, <i>Nannus hiemalis</i>	April	F.	1	9.7
	October	F.	2	9.3
	November	Imm.	1	9.6

TABLE 5—(Continued)
Miscellaneous Records (in A. O. U. Check-list Order)

Species	Month	Age and sex	Number of records	Average weight
Wood Thrush, <i>Hylocichla mustelina</i>	May	F.	2	48.8
	August	F.	1	53.8
Hermit Thrush, <i>Hylocichla guttata</i>	April	M.	1	32.7
	May	Ads.	1	28.1
	October	F.	1	31.4
		Imm.	1	30.2
Olive-backed Thrush, <i>Hylocichla ustulata</i>	September	M.	3	30.6
		Imm.	2	34.1
	October	Imm.	1	43.7
Gray-cheeked Thrush, <i>Hylocichla minima</i>	September	Imm.	1	31.7
		?	1	30.6
Golden-crowned Kinglet, <i>Regulus satrapa</i>	October	Imm.	2	6.2
Ruby-crowned Kinglet, <i>Corthylio calendula</i>	October	Imm.	1	6.0
Cedar Waxwing, <i>Bombycilla cedrorum</i>	August	Imm.	1	25.9
Northern Shrike, <i>Lanius borealis</i>	January	Imm.	1	56.8
Blue-headed Vireo, <i>Vireo solitarius</i>	September	Imm.	1	19.3
Red-eyed Vireo, <i>Vireo olivaceus</i>	May	M.	1	16.5
		F.	1	15.6
	June	M.	1	16.3
	July	M.	1	17.5
	August	M.	1	15.5
		F.	1	15.5
		?	4	16.5
	September	F.	1	19.5
		Imm.	1	17.4
		?	4	18.8
Warbling Vireo, <i>Vireo gilvus</i>	August	?	1	11.7
Black and White Warbler, <i>Mniotilta varia</i>	May	M.	1	10.8
	August	M.	2	11.2
		F.	1	9.2
Tennessee Warbler, <i>Vermivora peregrina</i>	September	Imm.	1	9.5
	October	Imm.	1	8.8
Nashville Warbler, <i>Vermivora ruficapilla</i>	September	Imm.	1	9.5
Yellow Warbler, <i>Dendroica aestiva</i>	May	Ads.	2	9.6
	July	Imm.	1	9.7
	August	Imm.	2	11.0
Cape May Warbler, <i>Dendroica tigrina</i>	August	Imm.	1	10.0
	September	Imm.	2	10.4
Myrtle Warbler, <i>Dendroica coronata</i>	April	F.	1	16.8 ¹
	May	F.	3	13.8
	October	Imm.	1	12.4
		?	1	14.0

¹ Very fat.

TABLE 5—(Continued)
Miscellaneous Records (in A. O. U. Check-list Order)

Species	Month	Age and sex	Number of records	Average weight
Black-throated Green Warbler, <i>Dendroica virens</i>	July	M.	1	9.6
	September	M.	1	9.6
		Imm.	5	8.8
	October	Imm.	1	10.1
Blackburnian Warbler, <i>Dendroica fusca</i>	May	M.	1	11.1
	September	F.	1	9.5
Chestnut-sided Warbler, <i>Dendroica pensylvanica</i>	August	Imm.	1	8.9
Bay-breasted Warbler, <i>Dendroica castanea</i>	September	F.	1	10.8
		Imm.	1	10.0
Black-poll Warbler, <i>Dendroica striata</i>	May	Ads.	1	12.4
	September	M.	3	11.4
		F.	1	12.8
		Imm.	3	11.5
	October	Imm.	4	13.9
	May	M.	2	18.3
		F.	1	19.1
Oven-bird, <i>Seiurus aurocapillus</i>	August	F.	2	20.2
		Imm.	2	20.0
		?	2	16.0
Water-Thrush, <i>Seiurus noveboracensis</i>	September	?	1	20.0
Mourning Warbler, <i>Oporornis philadelphia</i>	September	M.	1	11.2
Yellow-throat, <i>Geothlypis trichas</i>	August	M.	1	11.1
	September	M.	1	9.9
Redstart, <i>Setophaga ruticilla</i>	May	M.	2	7.8
	August	M.	1	8.2
		F.	1	7.2
	September	M.	1	8.8
		Imm.	2	8.5
Red-winged Blackbird, <i>Agelaius phoeniceus</i>	July	M.	1	61.4
Baltimore Oriole, <i>Icterus galbula</i>	May	F.	1	34.2
	July	Imm.	3	33.3
	August	Imm.	1	32.5
		?	2	32 ¹ / ₇
Bronzed Grackle, <i>Quiscalus quiscula</i>	April	M.	2	129.0
		F.	2	98.9
	June	M.	1	102.9
	July	M.	1	110.0
Scarlet Tanager, <i>Piranga erythromelas</i>	May	M.	1	24.0
Rose-breasted Grosbeak, <i>Hedymeles ludovicianus</i>	August	Imm.	2	40.2
Indigo Bunting, <i>Passerina cyanea</i>	June	M.	1	15.6
	August	F.	1	12.9
	September	Imm.	2	14.2

TABLE 5—(Continued)
Miscellaneous Records (in A. O. U. Check-list Order)

Species	Month	Age and sex	Number of records	Average weight
Purple Finch, <i>Carpodacus purpureus</i>	January	M.	1	25.9
		Imm.	1	24.6
	February	M.	4	25.4
	March	F.	1	25.4
	July	Imm.	3	23.2
	October	Imm.	1	41.6
Savannah Sparrow, <i>Passerculus sandwichensis</i>	July	M.	2	18.8
	August	M.	1	18.8
	September	M.	1	16.7
		?	1	17.8
Lincoln's Sparrow, <i>Melospiza lincolni</i>	May	Ads.	13	20.6
	September	?	7	18.0
	October	?	1	15.8
Swamp Sparrow, <i>Melospiza georgiana</i>	September	?	2	17.4

decrease again during the spring. Maximum differences between summer and winter months may amount to over 12 per cent. There is some unevenness in the weight variations from month to month in the case of individual species, but the significance of this must remain uncertain until more extensive data are obtained. The monthly fluctuations in weight of the Cowbird during the late spring and summer are opposite to those of other species and would be of special interest in connection with its parasitic reproductive habits, were it not that the number of records of adults of this species is rather few. Juvenal Cowbirds decrease in weight from June to August.

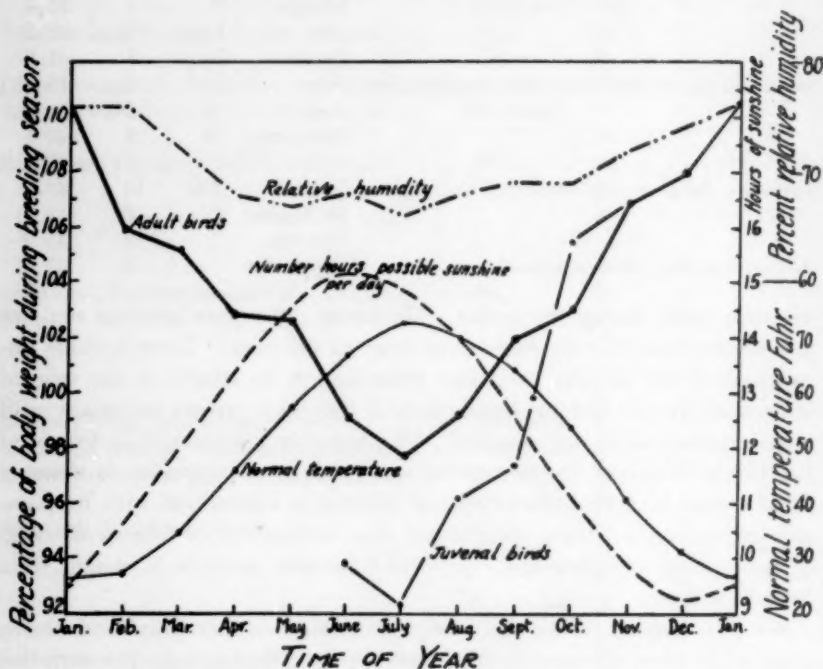
A study made of the monthly weight variations of individual birds shows that, while there are considerable, more random, fluctuations, the variation tendency evident in the above averages is also applicable to the individual. In other words, the monthly variations in the averages are not to be explained by chance combination of different individuals each month, but are due actually to weight changes in the individual, confirming similar studies of others.

A generalized curve based on monthly averages for all species is given in Text-fig. 4. Each month's weight is expressed in percentage of the average weight during the three principal breeding months of May, June, July. The conclusion appears warranted that adult birds of the species studied weigh, with some possible exceptions, more in the winter than they do in the summer.

Weight data on immature birds were prepared in the same way as were the data for adults. The average monthly weight of the immatures of each

species was divided by the standard breeding weight of the adult, to give a percentage figure. The data for all species were then averaged and plotted (Text-fig. 4).

In general, during the breeding season the juvenal birds weigh less than the adults, although by September or October they equal or surpass them. Text-fig. 4 indicates that during October the young birds may average more than the adults, but this may be an insignificant random variation.



TEXT-FIG. 4.—Average annual rhythm in weight of wild birds together with annual rhythm of various environmental factors.

In some species that breed farther to the north, immatures continue to weigh less than the adults in October, viz., White-throated Sparrow, White-crowned Sparrow and Slate-colored Junco. The rapid rise in body weight from July to October is even more pronounced in the immatures than in the adults, 13.1 per cent compared with 5.2 per cent. One might argue that this increase in weight of the immatures was due to the age factor, the birds becoming heavier as they grew older, were it not that there was also an increase in the weight of adult birds at the same time. However, the difference in the percentages of increase during these months is probably due to the maturing of the younger birds.

The possible explanation of these monthly variations in weight throughout the year is one of interest. The fact that even the juvenals weigh less in July than in June would indicate that the variations are not to be explained as due only to effects of reproductive activities, such as the feeding of the young. Partin (1933) also found that juvenal House Finches dropped in weight during midsummer, as they weighed more during May than in either June or July. This could hardly be due to the adaptation of the young to their own support, as he claims, for the older they get the more proficient they should become in finding food. The uniformity of the change from January to July and back again to January seems to imply some constant influencing factor that itself varies in a similar manner.

One factor that first suggests itself is the amount of available food. A quantitative estimation of the amount of food available each month is not possible but presumably it would be greatest in summer and early autumn and least in winter and early spring—yet the bird's weight varies in the direction opposite to what one would expect if the amount of food were the only important factor. Precipitation, as rain during the warmer months and snow during the colder months, varies little from month to month. Normal precipitation for the Cleveland, Ohio, region averages least in December and April (2.44 inches) and most in July (3.45 inches). The small difference between the extremes is not sufficient to suggest any direct or indirect effect on bird weight.

Monthly variations in normal temperature, normal relative humidity, and possible hours of sunshine per day are plotted in Text-fig. 4. Number of possible hours of sunshine per day varies from month to month in an inverse manner to the weight variations, but the extremes in these two curves do not exactly coincide. The number of hours of sunshine does not appear to be the important factor in causing weight variations, since if this were true one would expect a positive correlation, not an inverse one. With the longer days for feeding and the shorter warmer nights of summer the bird's weight should increase rather than decrease. There is a positive correlation existing between monthly variations in relative humidity and weight. Such a correlation would be important if there were reason to believe that differences in humidity affected body weight to any appreciable extent as by influencing the loss of water from the body. The experimental evidence for this is small, and temperature seems to affect this water loss from the body to a much more striking degree than does humidity (Kendeigh, 1934). One is hardly justified in suspecting that the difference of 10 per cent between the extreme monthly average humidities exerts any such great influence. The curve of normal monthly air temperature varies inversely with the curve of monthly weight. The extreme points in the two curves coincide as to the month in which they occur and the variation be-

tween the extremes is uniform in both cases. Presumably, the amount of temperature variation is also amply sufficient to affect body weight. Previous experimentation with passerine birds (Kendeigh, 1934) has demonstrated that weight loss is very responsive to variations in air temperature. One could logically expect some correlation between weight and temperature although at first one would expect a positive, rather than an inverse correlation. Other effects of temperature than merely on losses in weight must be involved, probably on weight gains during the daytime, if this inverse correlation is to be substantiated.

INFLUENCE OF TEMPERATURE ON VARIATION IN WEIGHT

Linsdale and Sumner (1934a) have studied the influence of temperature on weight changes with four Golden-crowned Sparrows kept in captivity and weighed several times a day for about two months in the spring. They found that "... all four birds showed increases on the same days and decreases on the same days. These simultaneous changes in one direction occur too often to be the result of chance. Some one external factor seems to have influenced the weight of these birds much more markedly than any others. From field observations of the behavior of this species, we suspected that weather records might furnish a clue to the explanation. Comparison of curves of weights and of weather records reveals that every well marked drop in weight was coincident with or within a day or two after a day of especially high temperature. Conversely all four birds tended to gain weight during cool weather. Preliminary tables of correlation suggest that the highest negative correlation of weight records is with the maximum temperature reading of two days previously. . . . Possibly the heat of late spring days may have some influence upon time of departure of this species for its northern breeding grounds." Hicks (1934) states that Starlings commonly gain weight in cold weather but may lose considerable weight during extreme cold. When weight is thus lost it may be regained during succeeding warm weather. In a recent study, Mrs. Nice (1938) found that White-throated Sparrows weighed less in the mild autumn of 1931 than in the cold autumn of 1932.

In order to determine in this study the possible effect of variations in air temperature on the weight of birds, average bird weights for individual days were compared with the average air temperatures. The first difficulty in working out this comparison arose in the determination of the proper period in which to average the air temperatures. Is the average weight of a bird during the day a response to the air temperature that same day or for a preceding period of time? Since the daily rhythm in body weight of these small birds is so marked, the body weight would seem greatly affected by conditions influencing both weight loss, especially during the preceding

night, and weight gain, through the amount of feeding during the daylight hours. In attacking this problem, use was made of the greater amount of available weight data for adult Chipping Sparrows and immature Song Sparrows. Averages were made of all the weights obtained of these species for all the days on which seven or more weights were available. In order to eliminate as far as possible any influence of time of day at which the weights were obtained, averages were made only for days when at least one-fourth of the weights were obtained during the other half of the day than the remaining three-fourths of the weights. Average air temperatures were computed from the Cleveland Weather Bureau records for the same day on which the weight averages were obtained, for the preceding night, for the same day and preceding night, and for the same day and preceding day. The temperature for a day is the average (really the median) of the maximum and minimum temperatures recorded during the twenty-four hours. The minimum temperature usually occurs near daybreak, the maximum usually in early or mid-afternoon. The night temperature was computed by averaging the mean temperature of the preceding day (a temperature which is usually actually attained about 8.00 p.m.) and the minimum temperature of the day following.

TABLE 6
*Correlation between Average Daily Weight and Average Air Temperature over
Different Periods of Time*

Period of time	Adult Chipping Sparrows			Immature Song Sparrows		
	Coefficient of correlation ¹	Standard deviation	Coefficient divided by deviation	Coefficient of correlation	Standard deviation	Coefficient divided by deviation
Same day	-.456	±.096	4.8	-.177	±.114	1.6
Preceding night	-.423	±.100	4.2	-.134	±.116	1.2
Same day and preceding night	-.422	±.100	4.2	-.130	±.116	1.1
Same day and preceding day	-.434	±.098	4.4	-.147	±.115	1.3

Data were available for sixty-eight days for the adult Chipping Sparrows and for seventy-two days for the immature Song Sparrows. Coefficients of correlation were computed between average daily bird weight and the average temperature during each of the periods mentioned above and are given in Table 6. In all cases an inverse correlation between body weight and air temperature is evident, i.e., the bird's weight increases with drop in air temperature, and vice versa. The correlation is good in the adult Chipping Sparrows but small in the immature Song Sparrows. With the

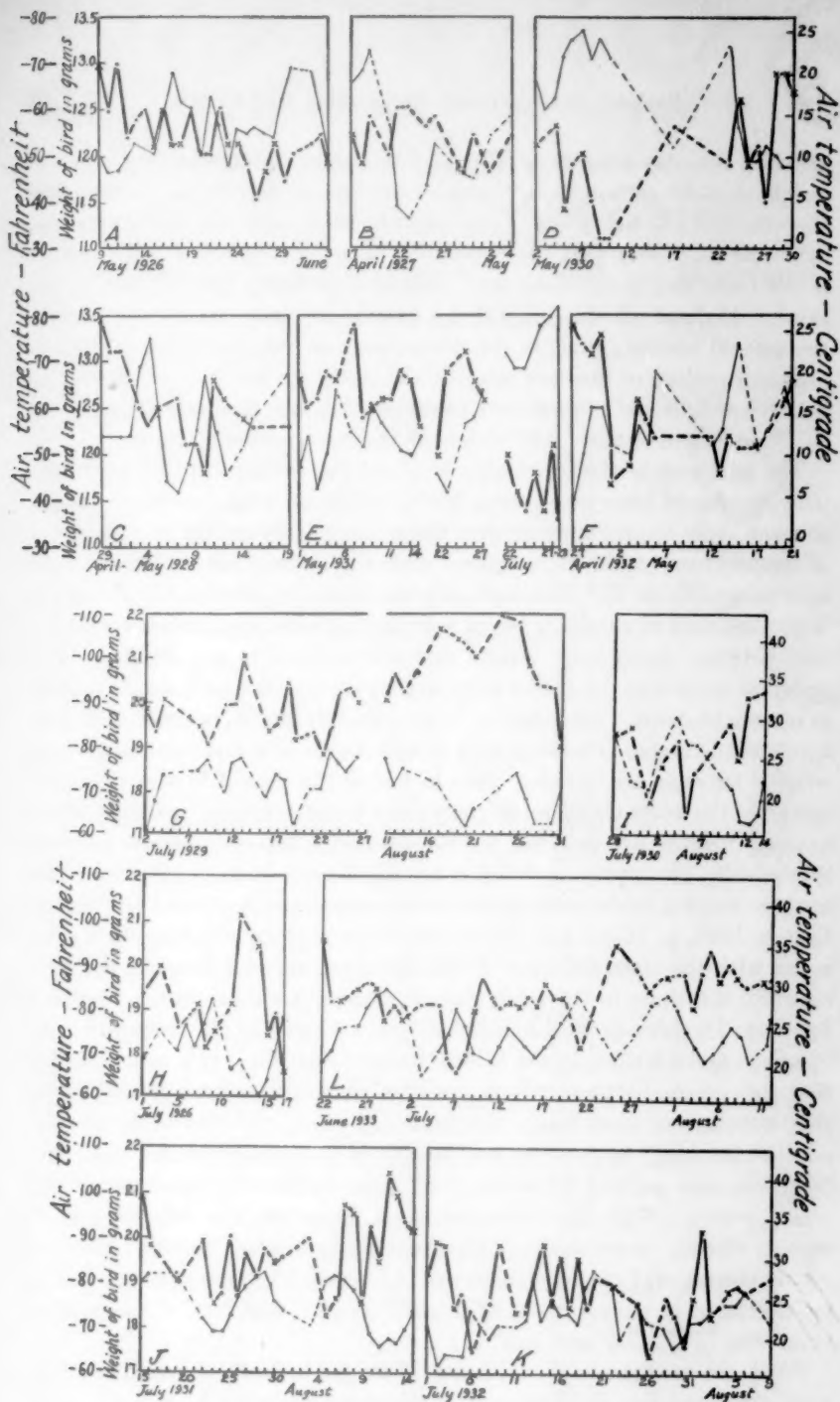
¹ A perfect positive correlation would give a coefficient of +1.0; a perfect negative correlation, -1.0; no correlation at all, 0.0.

Chipping Sparrow the correlation is very reliable, but with the Song Sparrow it is much less so. A coefficient equal to the standard error gives a percentage probability of only 68 that the correlation is not due to chance, two times the standard error raises this probability to 95, while three or more times the standard error makes it relatively certain with a percentage probability of 99.7 or better. The highest and most reliable correlation in case of both species is with the mean air temperature of the same day. Actually this mean daily temperature is approximately the average temperature for the daylight hours from daybreak until the middle afternoon, the actual time when most of the weight data were obtained. Taking the average temperature for the same and preceding days lowers the degree of correlation, but not so much as does the average night temperature. The data indicate that for further analysis of bird weights the best correlation would be with the air temperature during the same day.

A coefficient of correlation was calculated for average daily weight of adult Chipping Sparrows of both sexes and the average relative humidity on the same days. This proved to be $+ .214 \pm .116$, the coefficient being 1.8 times the standard error. Suspecting that this positive correlation with relative humidity may be a reflection of the temperature factor, since relative humidity often varies with temperature, we worked out a coefficient of correlation between the relative humidity and the temperature on the same days. This turned out to be $- .375 \pm .103$ (coefficient being 3.6 times the standard error). Thus, the positive correlation with relative humidity is probably due to both it and the bird's weight being inversely correlated with air temperature.

The next step was to study the day by day variation in body weight in response to the daily variation in average air temperature. The data for the above two species are plotted in Text-fig. 5. Weights of other species are not sufficiently numerous or suitable for this sort of analysis. It will be at once noticed that the general trends of the weight and temperature curves in the case of the adult Chipping Sparrow are inverse to each other. With the immature Song Sparrows the inverse relationship is much less apparent, although here and there it may be discerned. An age factor may be involved with this species not only because all the weights are for immature birds but also because the birds caught on different days may vary considerably in the length of time that they have been out of the nest. Still another consideration here is that the study with the Song Sparrow is for the midsummer months with their generally high air temperatures, while for the Chipping Sparrow the time involved is principally the cooler month of May during which the birds may be more responsive.

An intimate study of the charts for the Chipping Sparrow shows that the inverse correlation between weight and air temperature does not hold con-



TEXT-FIG. 5.—Day-by-day variations in weight of wild birds together with mean temperature on the same days. A-F, Chipping Sparrow; G-L, immature Song Sparrow. Heavy line—variations in the weight of the birds. Dots in heavy line—record for day being average of seven or more properly distributed weights. Crosses in heavy line—record for day being average of three to six weights only or where weights were irregularly distributed during the day; averages for these days are included only when supported by similar records on adjacent days. Light line—mean daily air temperature.

sistently true day after day. This may be due to an inadequate number of weight data for certain days, to other complicating factors, to the fact that the weight of a bird may not be responsive to small variations in temperature, or to the possibility that the correlation between weight and temperature is not such that if the data were plotted a perfectly straight line would result. Perhaps all these modifying factors are important; nevertheless, the general inverse trends in the fluctuations of these factors over shorter or longer periods of time are evident. This day by day inverse correlation between weight and temperature confirms what was similarly brought out by Linsdale and Sumner (1934a) for the Golden-crowned Sparrow.

The next step in the correlation involved the sorting out of the average daily weights of birds into groups falling within separate five-degree ranges of mean daily temperature so that the average body weight in each range of temperatures could be compared with the average air temperature for each range (Table 7). Although in some instances the number of records is not sufficient to eliminate minor fluctuations, in general, the inverse relation between mean body weight and temperature is conspicuous. The standard deviations are rather large so that the correlation is not as reliable as one might desire. Probably one reason for this is that, in order to include a sufficient volume of records over a wide range of temperatures, average weights for days are included when as few as three weights were obtained, except in the adult Chipping Sparrows and immature Song Sparrows where average weights are included for no days with less than seven weights. Statistically, the inverse correlation has significance in most cases when the average weights at the two extreme temperatures are compared (Arkin and Colton, 1934, p. 113). The differences between these weights, when compared with the standard error of this difference are: 6.2 times in the Tree Sparrow; 4.6 times in the adult Song Sparrows; 4.1 times in the Chipping Sparrow; 3.0 times in the English Sparrow; 1.5 times in the immature Song Sparrow; and 0.8 times in the White-throated Sparrow. It is to be recalled that differences between means are of high statistical significance when they are three or more times their standard error. On this basis, the correlation between temperature and weight is less certain in the immature Song Sparrows and the White-throated Sparrows but fully significant in the other species. With the immature Song Sparrows this may be due to reasons already mentioned. With the White-throated Sparrow, the correlation becomes of greater significance (2.7 times) when the average weights are compared at temperatures 43° and 72° F. (6.1° and 22.2° C.) instead of at 38° and 72° F. (3.3° and 22.2° C.).

When the coefficients of variability of weight in each temperature range were computed (by dividing average standard deviation by average body weight) and averaged, it was found that the species ranked from least

TABLE 7

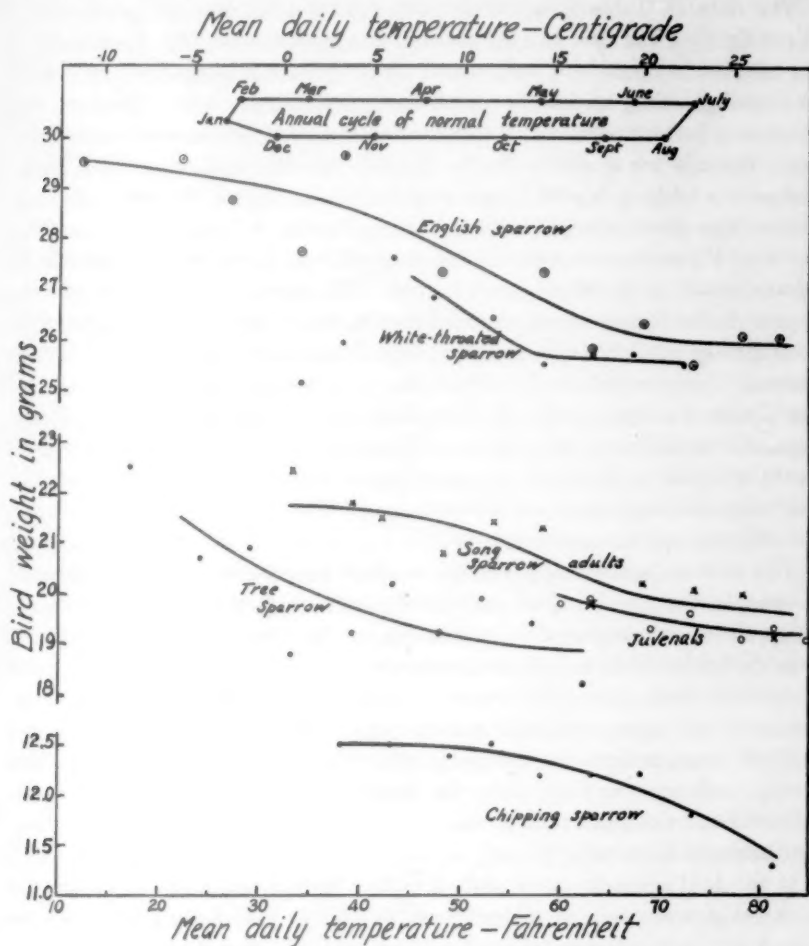
Statistical Correlation between Bird Weights and Air Temperature

Average air temperature		Number of days' records	Average weight	Standard deviation
Song Sparrow—adult male				
33° F.	+ 0.5° C.	1	21.3 gms.	—
40	+ 4.4	4	21.6	1.25 gms.
42	+ 5.5	5	21.7	0.92
49	+ 9.4	3	21.1	1.18
53	+11.6	4	21.5	0.73
58	+14.4	4	20.8	1.06
63	+17.2	3	20.0	0.35
68	+20.0	2	21.1	1.40
73	+22.7	2	20.4	0.85
78	+25.5	4	20.4	0.29
Song Sparrow—adult female				
40° F.	+ 4.4° C.	1	21.0 gms.	—
48	+ 8.8	3	19.5	0.66 gms.
53	+11.6	3	21.0	1.18
58	+14.4	3	20.9	1.30
62	+16.2	2	19.0	1.70
67	+19.4	2	18.6	0.30
72	+22.2	2	19.4	0.85
77	+25.0	3	19.8	0.69
Song Sparrow—all adults regardless of sex				
33° F.	+ 0.5° C.	8	22.4 gms.	1.14 gms.
39	+ 3.8	19	21.8	1.01
42	+ 5.5	9	21.5	0.95
48	+ 8.8	15	20.8	0.99
53	+11.6	24	21.4	0.94
58	+14.4	16	21.3	0.71
63	+17.2	14	19.8	1.27
68	+20.0	22	20.2	1.00
73	+22.7	17	20.1	0.76
78	+25.5	8	20.0	0.59
82	+27.7	5	19.2	1.26
Song Sparrow—immatures				
60° F.	+15.5° C.	1	19.8 gms.	—
63	+17.2	6	19.9	0.84 gms.
69	+20.5	23	19.3	0.70
73	+22.7	17	19.6	1.02
78	+25.5	17	19.1	0.85
82	+27.7	7	19.3	0.52
86	+30.0	1	19.1	—

TABLE 7—(Continued)
Statistical Correlation between Bird Weights and Air Temperature

Average air temperature	Number of days' records	Average weight	Standard deviation
Chipping Sparrow—adults			
38° F. + 3.3° C.	1	12.5 gms.	—
43 + 6.1	3	12.5	0.14 gms.
49 + 9.4	9	12.4	0.46
53 +11.6	19	12.5	0.46
58 +14.4	11	12.2	0.32
63 +17.2	4	12.2	0.35
68 +20.0	11	12.2	0.32
73 +22.7	9	11.8	0.45
82 +27.7	1	11.3	—
English Sparrow—all records			
12° F. -11.1° C.	1	29.5 gms.	—
22 - 5.5	2	29.6	1.50 gms.
27 - 2.7	3	28.8	0.48
34 + 1.1	1	27.8	—
38 + 3.3	3	29.7	0.78
48 + 8.8	2	27.4	2.80
58 +14.4	2	27.4	1.65
63 +17.2	7	25.9	1.24
68 +20.0	16	26.4	1.61
73 +22.7	9	25.6	1.57
78 +25.5	15	26.3	1.67
82 +27.7	10	26.2	1.27
White-throated Sparrow—all records			
34° F. + 1.1° C.	1	25.2 gms.	—
38 + 3.3	4	26.0	0.64 gms.
43 + 6.1	4	27.7	1.35
47 + 8.3	9	26.9	1.15
53 +11.6	10	26.5	1.06
58 +14.4	21	25.6	1.14
63 +17.2	16	25.8	1.60
67 +19.4	5	25.8	0.98
72 +22.2	5	25.6	0.89
Tree Sparrow—all records			
17° F. - 8.3° C.	1	22.5 gms.	—
24 - 4.4	2	20.7	0.50 gms.
29 - 1.6	3	20.9	0.53
33 + 0.5	5	18.8	0.58
39 + 3.8	14	19.2	0.68
43 + 6.1	6	20.2	0.72
47 + 8.3	4	19.2	1.31
52 +11.1	9	19.9	0.55
57 +13.8	5	19.4	0.80
62 +16.6	2	18.2	0.25

variable to most variable as follows: Chipping Sparrow (2.9 per cent), Tree Sparrow (3.4), immature Song Sparrow (4.1), adult male Song Sparrow (4.2), White-throated Sparrow (4.2), adult female Song Sparrow (4.8),



TEXT-FIG. 6.—Relation between average daily bird weight and mean daily air temperature.

and English Sparrow (5.3). With the exception of the adult female Song Sparrows, this order of increasing variability of weight corresponds with increasing average weight of the birds, rather than with decreasing weight as Groebels (1932) maintains. However, this subject needs further special study.

A few individual birds have repeated to the traps a sufficient number of

times to permit some study of their individual daily weight fluctuations compared with temperature. In spite of considerable random variation, a tendency toward inverse correlation between the two factors was evident.

The data in Table 7, when plotted, exhibit some interesting relations (Text-fig. 6). The first striking feature that is obvious in this figure is that the relation between bird weight and air temperature is not to be depicted as a straight line, at least over all ranges of temperature. Rather, the relation is better expressed by a curve which may be either concave or convex. Records are available for the English Sparrow and adult Song Sparrow over a wider range of temperatures than for any of the other species. From these more nearly complete series of data, it is apparent that the curve at higher temperatures is concave while at lower temperatures it is convex, really an inverted sigmoid curve. The curves for the other species appear to be fragments of sigmoid curves which would be completed if records were available over a wider range of temperatures. For the White-throated Sparrow and the Tree Sparrow, the curves appear to represent the lower part of a sigmoid; for the Chipping Sparrow, the upper part. These sigmoid curves appear to be approaching upper and lower asymptotes, that is, there appear to be upper and lower limits in variation of weight over the normally tolerated range of temperatures. These limits are different for the different species concerned.

The relation between body weight and air temperature is of considerable interest in the physiological ecology of birds. In a previous study (Kendeigh, 1934) experiments showed that heavier birds have a greater resistance than do lighter birds to low temperature over a period when obtaining food is difficult, since this extra weight is mostly fat. This fat is utilized to maintain the higher rate of metabolism at these lower temperatures. At high air temperatures the reverse is true. Lighter birds generally have a greater resistance to heat, since the proportion of their body surface area (internal and external) to body mass is greater, and surplus body heat may be dissipated more rapidly.

If the bird's weight is capable of only a limited amount of increase or decrease as a response to temperature, this factor may be of significance in affecting its temperature tolerance, consequently its distribution, migration, and abundance. For instance, if the temperature becomes very low, going beyond the maximum limit of adjustment, the bird's weight may drop, as shown by Hicks (*loc. cit.*), and if continued, may result in the death of the bird.

Of this group of species studied (Text-fig. 6), the Tree Sparrow appears to have the greatest possibility for weight increase with further drop in temperature although its curve is drawn with a considerable degree of uncertainty. It has the most northern distribution during both the breeding

and the wintering seasons, according to the A. O. U. 'Check-list' (1931 edition). Likewise, this species reaches its lower limit of weight decrease at the high temperature that is least extreme, and so appears least resistant to high air temperature. Its southern limit of distribution is farther to the north than that of any other species in this group. If the two lowest records in the range from 30° to 40° F. (-1.1° to 5.6° C.) for the White-throated Sparrow are disregarded, since they are based on averages for only five days in all, this species appears also to be highly tolerant of low temperature, since the curve does not flatten out, and next least tolerant of high temperature. It is distributed not quite so far north as the Tree Sparrow and occurs farther to the south in the summer. Likewise, it winters farther south. The English Sparrow is more tolerant of high air temperature than either of the two species above discussed and correspondingly occurs farther south during the breeding season. Due to the wide scattering of points the exact tolerance of low temperature can only be approximated. Apparently it is less than that of the Tree Sparrow which would agree with its less extensive northern distribution. From the data available one cannot say whether it is more or less tolerant of low air temperature than the White-throated Sparrow. The curve for the Song Sparrow is not drawn with any great certainty, but this species appears to be less tolerant of cold than any of the above-mentioned species, nor is it distributed quite so far north in the breeding season. Its tolerance of heat is about the same as that of the English Sparrow, which is out of harmony with the latter introduced species' more southern extension. The Chipping Sparrow appears the least tolerant of low air temperature and the most tolerant of high air temperature. It does not extend as far north during the breeding season as any of the other species and extends farther south than any species here in question, except, perhaps, the English Sparrow. Likewise, it winters farthest to the south, except for the English Sparrow.

Concerning the migratory status of these species in northern Ohio, the English Sparrow is a permanent resident, apparently better fitted than any other species for the range of temperatures throughout the year in this region. Comparing its curve with the yearly cycle of normal monthly temperatures shows that the steepest part of the curve, where the bird's weight is most responsive to changes in air temperature, covers almost as extensive a range in temperature as does the cycle of normal temperatures. In other words the upper and lower limits of weight adjustment are barely reached under normal conditions. The same general relation holds for the Song Sparrow, except that during the winter the curve reaches its upper limit of weight adjustment sooner. The largest proportion, by far, of the Song Sparrow population migrates south in the autumn and avoids these mid-winter temperatures, but a few hardy individuals remain. With the

White-throated Sparrow and the Tree Sparrow, it seems that they do not remain to breed because of inability to become adjusted to higher air temperatures than those that normally occur in May. The Tree Sparrow regularly winters and the White-throated Sparrow rarely does. The weight-temperature curve shows that the Tree Sparrow is fully capable of so doing. The curve for the White-throated Sparrow is inconclusive but this species may be fully capable of remaining over winter as far as temperature tolerance is concerned. That it does not do so may mean that in this case other factors, such as possibly food, may be more important. The Chipping Sparrow in this region approaches the upper limit of its weight adjustability during the breeding season, so it occurs only during the open summer season and migrates south in the autumn so that none winter this far north. In the case of all species, individual birds may occasionally show special weight-temperature adjustments that permit them to remain in regions to which the majority are not adapted.

Differences in the regional abundance of a species may be due to differences in the air temperature of those regions in relation to these weight-temperature adjustments. Likewise, differences in yearly abundance of a species may be correlated with yearly temperatures approaching or surpassing the upper or lower limits represented by weight adjustability.

DISCUSSION

A surprisingly large number of records of the weight of birds is required before reliable interpretations can be made. Aside from individual variations, sex, age, time of day, season, and temperature all produce fluctuations, and so in order to study the effect of any one factor allowance for all other factors must be made. Much of the discrepancy that occurs in the results of different investigators or of the same investigator with different species may be due to the insufficient number of records available.

Little attention was paid in this study to differences in weight of individual birds, largely on account of the considerable difficulty of obtaining a sufficient number of records of individual birds over a wide enough variety of conditions to make such a study significant. Individual differences undoubtedly do occur which are ingrained, as with other characteristics of the bird, in their hereditary constitution and in the conditions of their development.

Sex and age differences in weight are noted in the case of certain species. The significance of weight differences between the sexes may be hidden in their phylogenetic development and is not as obvious in the present adjustment of the sexes to their environment as one might wish. Age differences in weight are, of course, correlated with the problem of development, and

further discussion of this point may be deferred for a more extensive treatment of that problem.

The daily rhythm in body weight seems, at least in small passerine birds, not to be the simple matter of emptying the digestive tract at night and filling it again during the daytime, as is commonly supposed. This may, however, account for some of the differences between early-morning weights and those obtained later in the day. The digestive tract contains food probably amounting to less than 5 per cent of the body weight in small passerine species. In forms with crops the percentage will of course be larger. Experiments with passerine species (Stevenson, 1933) have shown that one and one-half to two hours is a long enough time to permit a small bird to fill again its digestive tract and begin egestion, and that birds as a rule maintain a moderately full stomach at all times—not alternately emptying and filling it to capacity as might be supposed. Thus, in the early morning hours intensive feeding may quickly replace the contents of the digestive tract lost during the preceding night. In the present study, very few weights were obtained before 7.00 or 8.00 o'clock in the morning, two or three hours after the beginning of early-morning feeding. Thus, the 5 to 6 per cent difference that was noted between maximum and minimum average hourly weights after the early-morning feeding period was well begun must be due in large measure to other factors.

No experimental analysis of what these other factors may be has been made, although certain theoretical points may be mentioned. In the metabolism of recently active and feeding birds Benedict and Riddle (1929) and others obtain respiratory quotients of 1.0 or thereabouts, which means that the carbohydrates furnish the chief source of energy and indicates that by volume the carbon dioxide loss equals the oxygen absorption. Between twenty and twenty-four (sometimes fewer) hours without food are required for pigeons and doves (which have crops) to lower their respiratory quotients from 1.0 to 0.7; the latter figure indicates that the birds are metabolizing body fat. Such birds would not ordinarily reach this condition during any night, since the number of hours of darkness during the winter may be fifteen and during the summer only nine. It appears, therefore, that the daily rhythm of birds with sizeable crops is more nearly a matter of filling and emptying this reservoir of stored food than in small birds lacking crops, although even in large birds part of the loss at night must be due to utilization of body resources.

For small passerine birds without crops, emptying of the alimentary tract of food during the daytime may be accomplished in about two and one-half hours. Possibly at night a longer time is required, but when this is completed, metabolism must gradually shift from a carbohydrate to a fat basis. Benedict and Fox (1933) found that canaries and English Sparrows

reach such basal or fat metabolism within ten to twelve hours. Out-of-doors and exposed to lower air temperatures, it is quite likely that fat metabolism is reached much sooner, and is probably reached every night. Baldwin and Kendeigh (1932) found that 4.7 hours was a sufficient period for House Wrens to reach basal or standard metabolic conditions, if the obtaining of their standard body temperature may be taken as evidence. With a respiratory quotient of 0.7 the weight difference between the carbon-dioxide output and oxygen intake is approximately equal. Loss of weight would be principally of water and excrement. The importance of water imbibition and loss in the daily rhythm is not known.

There is thus reason to believe that the daily rhythm in body weight of small passerine birds, such as are here studied, means not merely the emptying and filling of the digestive tract but actually an extensive utilization of stored carbohydrates and fats during the night and their replacement during the daytime. The metabolism of these small birds is so great in proportion to their bulk and their ability to store reserve food in their bodies is so limited that they live within a very narrow margin of safety and are highly responsive to variations in environmental conditions. This responsiveness to the environment is well defined in the correlations made between body weight and air temperature. At lower temperatures (unless extreme) there is not, as one might suppose, a drop in average daily weight, but rather an increase. The drop in weight at night is probably greater because with lower temperature there is an increase in the rate of metabolism and consequent utilization of reserve body supplies of carbohydrates and fats. During the following daytime, however, this increased loss is apparently more than made up by an increase in the amount of feeding. Since the coefficient of correlation between variation in weight and the preceding night temperatures (-0.423) is almost as high as the coefficient using the temperature of the same day (-0.456), it would seem that the primary stimulus for increased feeding may lie somehow in the loss or in the losing of the weight itself, a stimulus which is carried over into the following day. However, the low temperature may have some direct stimulating value in itself, as well, since the coefficient using temperature of the same day is even higher than that for the preceding night, and during the day there is no loss in weight.

That birds actually do feed more on cooler days has been shown by Stevenson (1933) who found that about twice as many sparrows were caught in banding traps, where they had come for food, on days with air temperatures averaging 71° – 75° F. (21.7° – 23.9° C.) than on days with air temperatures averaging 81° – 85° F. (27.2° – 29.4° C.). Mr. William H. Long of the University of Michigan has kindly consented to the inclusion here of some of his unpublished data on game birds that show the same relation between feeding

and air temperature. In the winter of 1935-36, during a period of seventy-three consecutive days with temperatures around or below freezing and including fifteen days below 0° F. (-17.8° C.), fourteen adult Bob-whites consumed on an average 1.72 grams per hour per bird or 17.2 grams for the ten-hour day. Six birds, held during the same period as controls at a temperature of 72° F. (22.2° C.), consumed on an average 1.29 grams per hour per bird or 12.9 grams for the day. Ten birds of the same species, during a period of excessive heat during the summer of 1936 when the temperature did not fall below 70° F. (21.1° C.) and at one time reached 104° F. (40.0° C.), consumed on an average 0.62 grams per hour per bird or 9.24 grams for the fifteen-hour day. A pair of Ring-necked Pheasants (*Phasianus colchicus torquatus*), during the same two periods above mentioned, consumed, during the winter period, 5.94 grams per hour per bird or 59.4 grams per day and, during the summer period, 1.47 grams per hour per bird or 22.0 grams per day. During periods of severe cold in winter, some species may temporarily refrain from feeding in order to linger in protected shelters or huddle with other individuals to conserve body heat.

The apparent over-compensation, by increased feeding, of the weight lost during the preceding night is an efficient safety factor in the life of the bird, since it better prepares the bird to tolerate unfavorable weather conditions to come. There is, nevertheless, a limit to this possibility of adjustment. If the temperature drops too low or endures too long, the bird may find itself during the daytime unable, by increased feeding, to make up the losses at night. It would then be necessary for the bird, in order to survive, to move into a more favorable environment. On the other hand, during days with high temperature, there should be less loss of weight at night. During the following daylight period, there should then be less need for feeding. The amount of feeding may, under these conditions, be so far reduced as actually not to make up for the weight lost during the preceding night.

Reduced feeding may be correlated with generally reduced activity as temperatures are raised. Mr. William H. Long has compiled for July and August over a period of four years some five thousand individual observations of the amount of activity displayed by birds in their natural habitats. He finds a very high negative correlation with temperature (-0.91 ± 0.016) and a lesser correlation with relative humidity. With reduced activity there is diminished metabolism and heat production, which is of decided benefit to the bird in hot weather. Whether or not the reduced feeding is the result of the generally reduced activity is a matter of importance but can only be speculated upon at the present time.

The yearly rhythm of weight is one of considerable interest. The increase in weight during the autumn and winter is marked. After the late-summer and early-autumn molt, the bird has the heaviest coat of feathers

during the entire year. This makes the weight loss when without food much less than at the same temperatures during the summer because it is equivalent to keeping the bird at a higher air temperature (Kendeigh, 1934). Their bodies are less exposed to air temperature than they were during the summer. Even though in the autumn, night temperatures are somewhat lower than in the summer, the birds apparently at first lose weight at night less rapidly. They may or may not respond to the lower temperatures during the daytime by increased feeding, but the food consumed appears more completely stored in their bodies as reserve. They thus increase in weight. The weight increase would be even greater except that the night time without food is becoming increasingly long and the temperatures increasingly low as the season progresses. Some species migrate out of the region before these temperatures become so extreme as to offset entirely the advantage of their heavier feathering. Permanent-resident species continue to tolerate these increasingly long cold nights and are ever able to feed sufficiently during the day to more than offset the losses at night except occasionally when very severe weather occurs. Without nesting cares or other drains on their vitality, they may devote a larger share of their time to feeding and are able to utilize their energies more completely to tolerate the winter conditions.

The decrease in the feather covering of the body that began at once after the autumn molt, reaches appreciable proportions by spring and becomes extensive by summer. This means that the body becomes more and more exposed to the effects of air temperatures, there is increased heat radiation from the body, metabolism is proportionately increased even at moderate air temperatures, and weight losses during periods without food go on at a faster rate. This is compensated, to a larger or smaller extent, by the rising air temperatures and decreasing number of hours of darkness, but joined with this increased rise in air temperature may be a reduced rate of feeding. It is not known whether the variation in rate of feeding is influenced directly through the temperature senses of the birds or indirectly through the changed metabolic conditions produced. The amount of feeding during the daytime may be further reduced by the obliged utilization of part of the time for carrying on courting and nesting activities. There is a demand for energy for the maturing of the ova and the spermatozoa as well as associated activities of singing, nest building, possibly incubation, and certainly the care of the young. The correlation between day by day fluctuations in weight and temperature would indicate that temperature must, however, be one of the important factors involved, probably even more important than reproductive activities. The composite effect of these various influences is a gradual weight reduction until mid-summer.

Molting and renewal of feathers in August and September is not joined with a decrease in weight; rather there is an increase in weight at that time. The possibility exists that weight changes may be also affected by variations in activity of the thyroid or other endocrine glands, which may be correlated with seasonal changes in the rate or type of metabolism. Such endocrine activity may in turn be related to changes in temperature, length of day, or other environmental influences. Some studies of seasonal changes in endocrine activities have already been made but are not advanced sufficiently to warrant extensive discussion at the present time.

This study of yearly rhythm in weight exposes interesting correlations with the migratory status and distribution of the various species. Limits of variations compatible with normal activity and comfort out-of-doors become apparent. These, presumably, represent limits of physiological adjustment to high and low air temperatures, and such limits of adjustment vary among permanent residents, winter visitors, summer breeders, and transients. Migration would appear not to be a stereotyped instinctive behavior based on internal rhythms alone, but instead is definitely related and probably dependent upon proper environmental influences for its release. Likewise, the reasons for the different ecological distribution of species within the same geographic region become more and more clear as further studies are made of the interrelations between physiological processes, their limits of variation, and environmental influences.

CONCLUSIONS

1. Differences occur between the weights of different individual birds but such differences are scarcely greater than may occur in the weight of a single individual at different times. The individual varies slightly less in its weight the more nearly it approaches the average weight of the species.

2. In nine out of twenty-four species studied to determine the effect of sex on body weight the two sexes were of nearly equal average weight, in eleven species the males were definitely heavier, and in four species the females were heavier. The accumulation of a greater volume of records may possibly change the relative status of the sexes in a few species in which the number of data now available is not great.

3. In general, juvenal birds weigh less than the adults during the summer. In many species this difference is erased by October, but in other species it persists longer.

4. There is a daily rhythm in the weight of the birds investigated, with the greatest weights being reached in late afternoon or early evening and the lowest weights early in the morning. The weight increases most rapidly during early morning, slows up during the middle of the day, and increases rapidly again during late afternoon and early evening. Periods of most

rapid weight increase correspond with periods of most active feeding. The extreme weight variation of the smaller passerine species during the day may amount to between 8 and 12 per cent of the mean daily weight but this may vary with differences in air temperature, amount of feeding, and other activities.

5. There is a yearly rhythm in the weight of the birds investigated with the greatest weights being reached usually in midwinter and the lowest weights usually in midsummer, and this is inversely correlated with monthly variations in temperature. Average monthly weights, differentiated as to sex and age, are given for eighty-five species on the basis of a total of 13,546 records.

6. There are day by day variations in the weight of birds correlated inversely with the average temperature especially for the same day.

7. The average daily weight of birds when plotted with average daily temperature shows an inverse sigmoid curve type of correlation, with a maximum weight limit being approached at low temperature and a minimum weight limit being approached at high temperature.

8. Differences in the weight-temperature curves and the points at which the limits of variation in weight consistent with normal health and vigor are reached occur among species and may be correlated with differences in their distribution and migratory status.

9. The manner and extent of fluctuations in weight give further evidence that birds in their physiological adjustments are highly sensitive to environmental influences, and that this interrelation between function and environment greatly affects their behavior.

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NESTING OF THE TURKEY VULTURE

BY W. BRYANT TYRRELL

Plates 16-17

On the afternoon of January 16, 1932, while walking along the Patapsco River in the Patapsco State Forest, about ten miles west of Baltimore, Maryland, I noticed a large number of Turkey Vultures (*Cathartes aura septentrionalis*) soaring high above us, some so high that they were mere specks against the bright sky. There were hundreds of them and their intermingling circles made a kaleidoscope pattern as we watched them through the bare branches of the trees. As the shadows lengthened, the birds came to roost in the uppermost branches of several tall trees. On February 22, we again visited this roost and concealed ourselves near three roosting trees. It was interesting to watch the great birds as they came sailing noiselessly over us, their naked red heads gleaming in the last rays of the sun, their dark, silvery-lined wings moving only to catch the movements of the air currents. Some, after alighting, would shake themselves until every feather was ruffled, giving them a most unkempt appearance. Others would alight on branches where one or more were already roosting and the impact of their landing would throw those already there off their balance, resulting in many awkward and ludicrous balancing movements of body and wings. A few would sit and preen, while some were always watching the movements of their neighbors, cocking their heads first on one side and then on the other to see each newcomer. A few seemed to be resting oblivious of what was going on around them. Quiet reigned as dusk deepened into darkness, with only an occasional bird coming to roost. At 5.30 p.m. when it was quite dark, we counted 147 birds in the three trees in front of us. Probably as many more were in other nearby trees, so that there must have been between three and four hundred birds in the roost.

On April 15, 1933, while hunting for Red-shouldered Hawks' nests in a piece of virgin timber on the Middle Branch of the Patuxent River, near Laurel, Maryland, we found a Turkey Vulture's nest by the side of a fallen tree, an ideal location for photographing. The nest, which contained two fresh eggs, was merely a slight depression around which were a few sticks. Our next visit was on April 30. As we approached the region of the nest the buzzard rose with heavy wing beats until it cleared the tree tops and then joined its mate who was gracefully circling above. The two eggs, though somewhat soiled, were still there. We were unable to visit the nest again until May 21. As we came near, we saw the old bird on the nest, with her head under the log. We approached stealthily and soon were so close that we thought she must have been injured, but I was taking no

chances, and cautiously got closer and closer until I was able to grab her. When I lifted her from the nest and disclosed the helpless young, she made no sound, nor did she struggle to get away, but lay limp in my hands. To our surprise, when she was released she went back to the nest and covered her downy young. Several times we picked her up, releasing her each time farther from her nest, only to have her run clumsily, with wings dragging, back to her young. We wanted to get her out of the way so that we might work with the young. Taking her from the nest had no effect, so we put her on the log above. No sooner had we let her go than off she flew.

The young were helpless little creatures, unable to hold up their heads for long, unable to stand, just a bundle of white down not as big as one's fist, with face, bill, front of the neck and the crop a bluish black, while the legs and feet were a dirty gray. We estimated that they were three or four days old but were later informed by A. C. Bent that they were probably nearly a week old. Two weeks later, on June 4, we again visited the nest. In this time the young had trebled in size but otherwise looked the same, except that the sheaths of the primaries, which were about three-quarters of an inch long, were beginning to show, each tipped with a tuft of down. On this visit while we were near the young they were almost continually uttering a hissing sound like escaping steam. They were clean, as was the nest area, and fairly free from odor until after we started to handle them. Then they proceeded to disgorge the vilest-smelling material I have ever been near. A heron rookery, where the stench is terrible, is mild compared to the odor of that disgorged putrid food. By June 24 the young had grown considerably. Although they were still mostly covered with white down, the primaries and their sheaths were then about four inches long, the secondaries about three inches long, the coverts were beginning to show, and the tail feathers were about two inches long. The young birds resented our approach and when we were near, uttered their hissing noise, though not as continuously as on our last visit. Their feet and legs had grown sufficiently so that we could band them. The band numbers were C 616458 and C 616459.

My partner on these visits, Edward McColgan, and I shall long remember our visit of July 4. The recent heavy rains had swollen the river over its banks and after the water had subsided a film of soft mud about two inches deep covered everything. We made our way cautiously through the hot, sultry woods, trying to avoid slipping in the soft mud among the nettles. On reaching the nest we found that the young had changed considerably. They were about eight weeks old and of nearly adult size with the feathers of the wings and tail well developed, but the down still clung to the neck and under parts, and the bill and face were still black.

On July 17, when we approached the nest tree, both young birds were

standing on the log. They were then about ten weeks old and the wing and tail feathers were fully developed. There was practically no down on their backs but it still clung to the neck, although some feathers were beginning to show through; the under parts were still white and the bill and face, as before, were black, with a peculiar band of thick down over the top of the head. Although they were unable to fly they used their wings as they ran to hide under a nearby log. It was remarkable how easily so large a bird could become invisible among the foliage.

When we approached the nest on July 25, both young were to be seen but one managed to get out of sight among the roots of an upturned tree and was not found until we were about to leave. They were then about eleven weeks old and fully grown; one still had some down on the neck and under parts, while the other,—the more active of the two,—had only a few patches on the legs and under parts; the band of thick stubby down over the top of the head was still present and the bill and face of both were still black. It could not have been long after that visit that they flew; for one, by vigorously flapping its wings four or five times, was then able to fly about twenty feet.

404 Frederick Road
Catonsville, Maryland

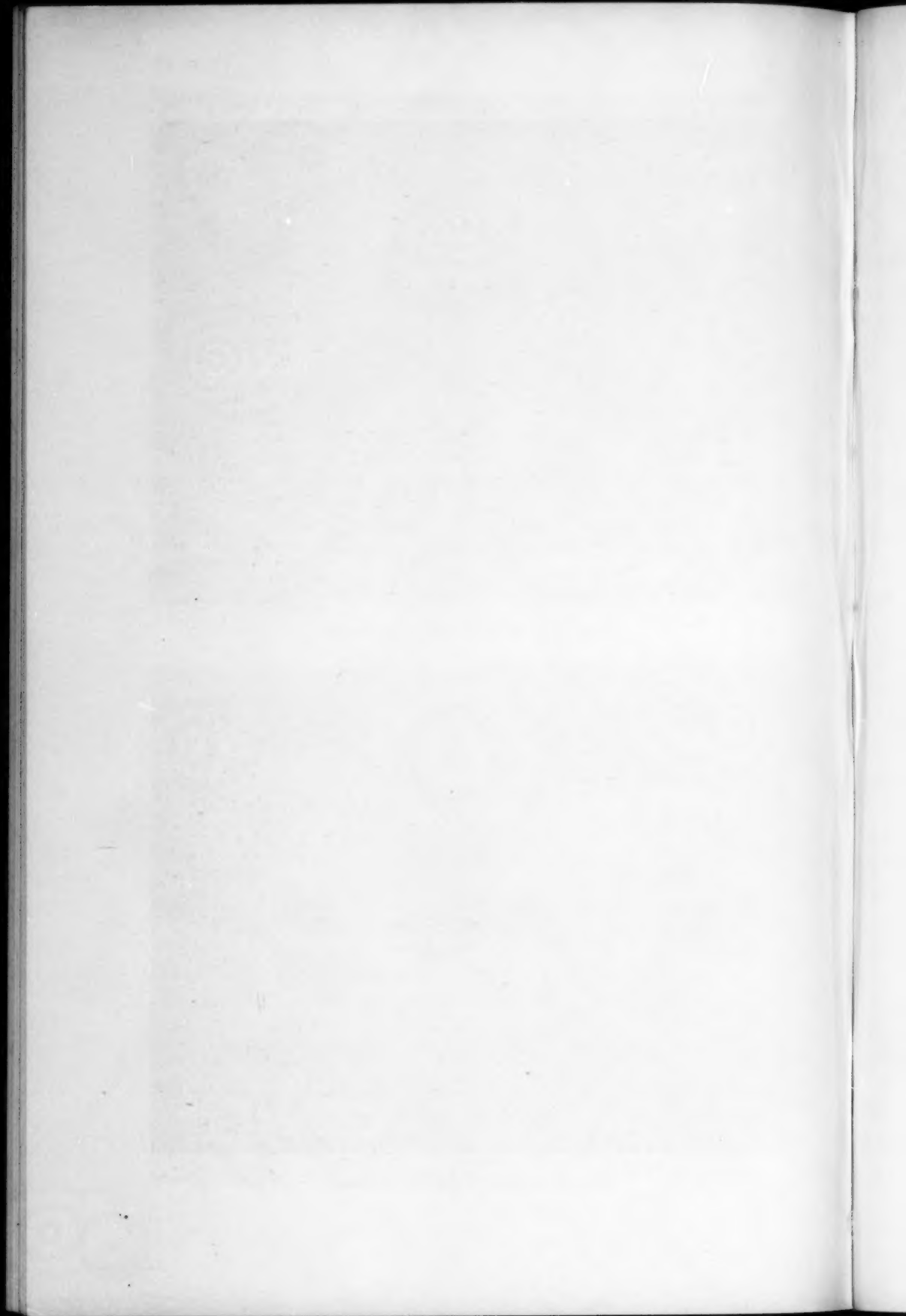


TURKEY VULTURE'S NEST BY A FALLEN TREE



YOUNG TURKEY VULTURES IN DOWN





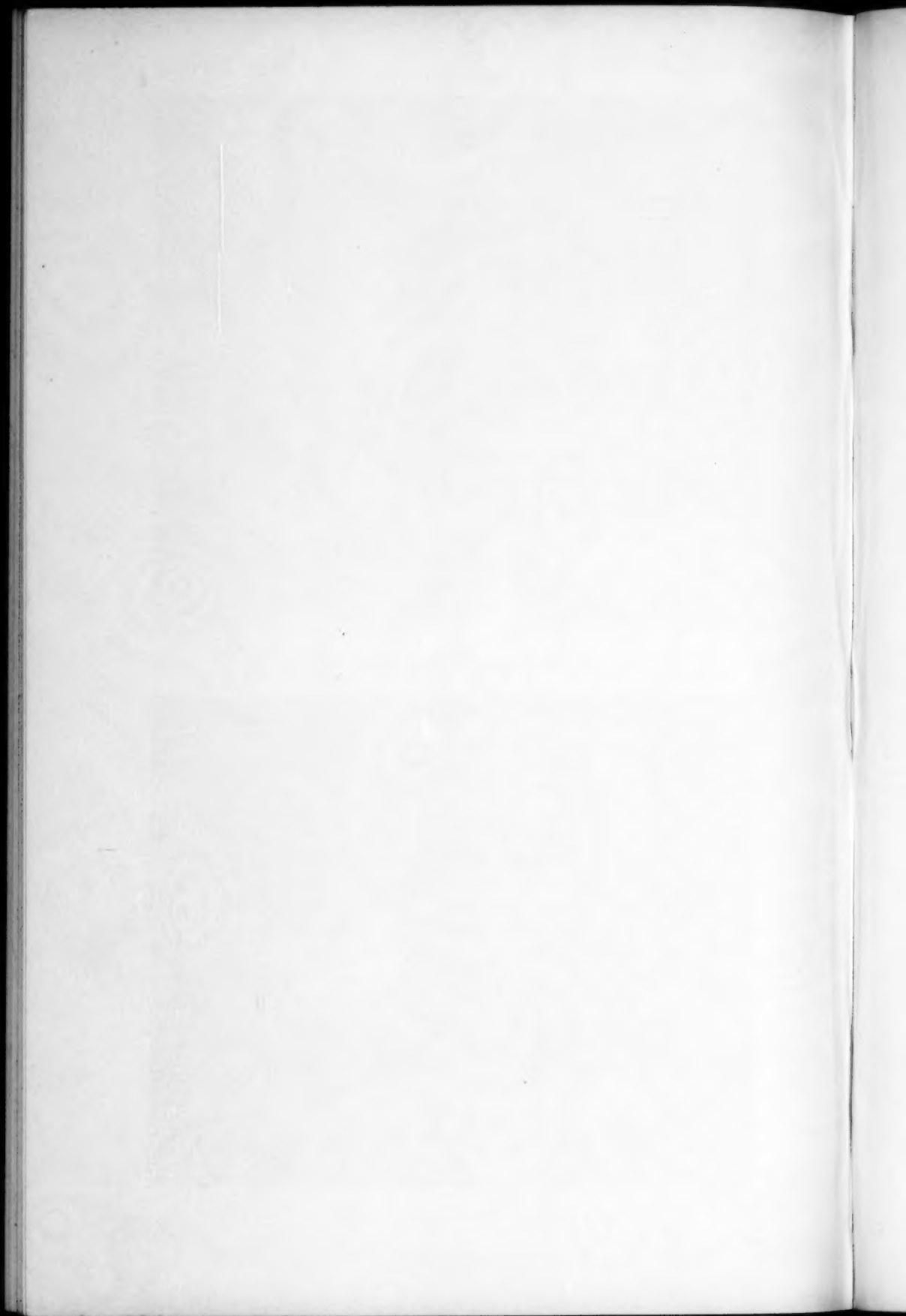


YOUNG TURKEY VULTURES ABOUT EIGHT WEEKS OLD



YOUNG TURKEY VULTURES ABOUT ELEVEN WEEKS OLD





UNPUBLISHED MANUSCRIPTS BY COTTON MATHER
ON THE PASSENGER PIGEON

BY ARLIE W. SCHORGER

WHILE working on a history of the Passenger Pigeon (*Ectopistes migratorius*) it was found that Cotton Mather had submitted several ornithological manuscripts to the Royal Society of London.¹ Only extracts from this material have appeared in print. The two manuscripts on the Passenger Pigeon, given below, are not dated but appear to have been written in 1712 and 1716, respectively. It is not difficult to arrive at a satisfactory reason for the failure of his manuscripts to receive full publication at the time of preparation. An abstract of one of his letters to the Society reads as follows: "As to the Itinerants; he takes notice of vast Flights of Pigeons, coming and departing at certain Seasons: And as to this, he has a particular Fancy of their repairing to some undiscovered Satellite, accompanying the Earth at a near distance."² Some information on pigeons is given also in his 'Christian Philosopher'.³ The incredible numbers in which the Passenger Pigeon occurred coupled with "religious improvements" could have made an editor wary even in those days.

The manuscripts aside from historical value contain some interesting information. There is recognition of a chronological division of duties between the male and female while the pigeons were nesting. In so far as known, Mather is the first to mention the production of "milk" by the Passenger Pigeon. It is a tribute to the keenness of observation of the Indians that they should recognize that this substance was formed by a metabolic process and that to it was due the phenomenal growth of the young pigeon. It will be noted, furthermore, that the Indian name for the Passenger Pigeon "signifies Wanderers." The common Algonquian word for pigeon is *omimi* but no similar word resembling it and meaning *wanderer* is known at this day. Mather's statement is probably of Natick origin. Williams⁴ gives *wuskowhan* as the name for pigeon in the Narragansett dialect, while Lewis states more specifically: "The Indians called the pigeon *wuscowhan*, a word signifying a wanderer." The colonists acquired much of their knowledge of natural history from the Indians, so that *migratory* and *passenger* in English are but synonyms of *wuskowhan*. The latter, doubtless, was also the inspiration for the specific name *migratorius* subsequently applied by Linnaeus.

THE PIGEONS

Proposing to answer your desire of a Treat with a further mess of o^r Pigeons, I must in the first place confess, that they sometimes make one

think of the *Quails*, with which y^e Appetites of the Israelites were gratified in y^e Arabian Desert. The Sacred Historian mentions these as arriving in such a Number, that they were *as the Sand of the Sea*, and they were scattered not only thro' y^e whole camp, but also a day's journey which we may take to be twenty miles at least, on both sides of it: And it is added they were *as it were two cubits high, upon the Face of y^e Earth*. I know, both *Jonathan* and *Jerome* carry that passage, as only meaning that they flew *Two cubits high above the Earth*. A Jewish Rabbi, therefore, notes upon it, that their Flight was *Ad humani Pectoris Altitudinem*; that so there might be ye Less of Trouble in catching them: And Philo⁶ takes notice, that such a Flight was ordered, εἰς εὐθηνον that they might have the more *Easy Fowling* of it. Nor is this disagreeable to Pliny's⁷ Remark, on y^e *Quail*, That, *cum ad nos venit, Terrestris potius, quam sublimis est*. But, why may it not suffice to say, that they lay in scattered and numberless Heaps, every where, not far asunder *Two Cubits high*. And what we render *Ten Homers*, which are mentioned as y^e Least Quantity of y^m gathered by any who employed themselves in gathering of y^m, a famous interpreter, I remember, directs us with very good reason to read, *Heaps*, rather than *Homers*; and if I don't forgett, both Onkelos, and the Arabic, do read it so. And therefore there was no need for, A *Lapide*, to be at the pains of casting up the precise Number of the Birds then gathered by the Israelites, which he finds to be *Twelve Thousand Millions*. On this occasion I call to mind Varro⁸ tells us, that y^e *Quails* visited *Italy* in the season of them, *immani Numero*. Pliny⁷ and Solin⁹ add that such was the Number of the *Quails* then flying over the *Mediterranean*, as to endanger the Vessels, which thro' weariness they would sometimes light upon. But there was no where a greater plenty of *Quails*, than in *Egypt*, from whence they were now brought unto the *Israelites*. Many ancient writers tell us, They were so many in their Seasons, that the Egyptians not being able quickly to devour y^m salted y^m up; tho' Theocritus tells us, there were Thirty Thousand Towns in that country; and Josephus tells us, there were many more than seven hundred & fifty myriads of people there. But, while I am thus falling to a Dish of y^e Israelitish *Quails*, Job Ludolphus¹⁰ comes in, & wholly turns my Stomach, by proposing, that there were no *Quails* at all in y^e Story, but that all this while they were no other than *Locusts*, which are intended by the Term *Selan*, which we have mistranslated, *Quails*, upon y^e credit of one single Jew, who is not always to be relied upon.

A better Dish than *that*, you would have in y^e *Pigeons*: A Bird which in almost every thing resembles your *Turtle-Doves*; only that it is a little Bigger. The *Numbers* of those, that visit us in their *Seasons*, are such, that I am almost afraid of giving you a true Report of them, lest you should imagine a *Palephatus* were imposing his *Incredibles* upon you. Yett it will

a little answer y^e intention of y^e Correspondence wherewith you favour me, if I do report something of them.

I affirm to you then; That sometimes we have mighty Flocks of those *Pigeons* flying over us; thousands in a Flock; y^e best part of a mile square occupied by a Flock: These passing along, y^e Welkin in a manner obscured & covered with y^m; & several Hours have run out, before ye appearance of these Birds thus making y^e best of their way have been over.

They have been frequently sold for Two Pence or Three Pence a Dozen: tho' two or three of y^m, Roast or boild or broil'd, may make a meal for a Temperate Man. Yea: they are sometimes kill'd in such plenty, that the cuntrypeople feed their Hogs with y^m. One of my Neighbors has killed no fewer than two & thirty dozen at one Shott.

Gentlemen have complained unto me, that they have Litt in such Numbers on their Trees as to break down y^e Limbs thereof, & spoil their Orchards.

They will sometimes roost at Night in such Numbers among y^e Thickets, that y^e people with no other weapons than Sticks & Poles kill Thousands of y^m.

One worthy person of my Acquaintance had a Descent of them in his Neighborhood in y^e month of *December*, a very unusual Time of the Year; while there was yett no *Snow*, but many *Acorns* on the ground, which 'tis thought, might then draw y^m thither. At their Lighting on a place of Thick Woods, the Front wheel'd about, the Flanks wheel'd inward, and Rear came up, [S^r, He was a *Captain*, who gave me the written Relation!] and pitch'd as near to the Center, as they could find any Limb, or Twig, or Bush to seize upon. Yea, they satt upon one another like Bees, till a Limb of a Tree would seem almost as big as an House. 'Tis incredible to tell, how Large & Strong & Many Limbs were broken down, by this New Burden upon y^m. The breaking of y^m were heard at a mighty Distance. The Birds filled more than Half a mile, about from the Center, and the Noise they made, was like ye Roaring of the Sea. The Night was dark; but this Gentleman, and his Sons, with Guns & some other less Noxious Tools, laid in among y^m, & some they took alive with their Hands; and in y^e morning found y^e Number of their Slain, to be one hundred & three Dozen; besides, what some other people had carried away.

A few Days ago I was at a Table of some Superior Gentlemen, relating some of these things: and One, whose Veracity was not to be disputed, said He had a Story that would cap all of mine; For (said he,) *I have catched no less than Two Hundred Dozens of Pigeons, in Less than two minutes of Time & all in one Trap*: The pleasant mention of the *Whetstone*¹¹ on that occasion, obliged y^e Gentleman immediately to explain himself; and add; *Such a Number broke into my Barn, & bin—by shutting y^e Door, I had y^m all at my Mercy*. And y^e Truth is; They have appear'd in such Numbers

that it has been thought, all y^e Corn in y^e Country, would scarce afford y^m a Breakfast. But o^r people, enjoy as much of a Divine *Mercy* in such a Supply for o^r Table in y^e Wilderness, as if y^e Bird *Racham*,¹² which y^e *Talmud* tell of, were making his Appearance.

O^r Indians call these *Pigeons*, by a Name that signifies Wanderers. But where they go, when they leave us, no man alive can tell. They go not unto o^r English Colonies to the Southward. If you will not allow y^m to retire unto some Receptacles above us in o^r Atmosphere: (which, I wonder, how you can account for your *Season-Birds*, without supposing,) they must have a Retreat in South-west parts of *America*, whereof we are not yett advised.

I will take leave at this time, to add one passage more, which my Friend Captain Billings gives me in a Letter from whence I transcribe this paragraph.

Once in *April*, it being y^e time of the year that those Birds were on their Nests, they came down to feed on the *Salt-Marsh*. After y^e manner of Doves, The *Cocks* take care of y^e Young ones in y^e Nests, for one part of the Day; & y^e Hens y^e Other. I have often killed no less than twenty Dozen at one Setting; but all generally of one Sex. The *Cocks* were always by far y^e fattest, and when we opened them we found in their *craws*, about y^e Quantity of half a Gill of a Substance like a Tender *Cheese-Curd*. I asked Some of o^r Indians, what those *Pigeons* had Eaten; and why the Hens did not feed on the Same. They answered, It was nothing they had eaten, but something that came naturally into their *crops*, as milk does into the Dugs of other Creatures; and that the Hens could not keep their Young alive, when first hatched; and that this nourished the young Birds, & caused them to grow fatter, & fly in half y^e Time, that any other Birds could attain to it.

All that now remains is to wish you as many Friends, as there have been seen Fowls in y^e mighty Flocks I have told you of; but among them, a very particular consideration for him, who would be,

Sir, Heavily & Forever

at your Service.

[COTTON MATHER.]

THE NIDIFICATION OF PIGEONS

You were not so cloy'd with a small Treat of my New English *pigeons*, which I endeavoured for you, in a former Letter, that you will be unwilling to know any further of them.

Among the entertainments of your *ornithology*, and in y^e vast field of wonders for which y^e *Feathered Tribes* have winged your curiosity, you have

allowed a particular consideration to that surprising skill with which their *nidification* is managed.

It surprises us to see, what secure places they find out, and what *proper* ones where their young may ly safe & warm, & have their growth promoted. With what an artificial Elegancy are some of their Nests prepared! Such, that *Human Skill* could hardly imitate it!

We celebrate y^e Nests of y^e Indian Bird composed of the Fibres of certain Roots w^{ch} we're so curiously interwoven, that they cannot be beheld without astonishment. These *Nests*, the sagacious Bird (which therefore with good reason they call, a *subtle Jack*) hangs on the ends of y^e Twigs, of y^e Trees over the Water to secure its Eggs & its young from y^e Ravages of *Apes*, & other Beasts, that else would prey upon th^m. And what shall we say of the *Flamingo's*? They build their *Nests* in shallow ponds, wherein there is much mud; which they scrape together into little Hillocks, like Islands appearing out of y^e water, about a foot & [a] half high from y^e bottom. They make the Foundation of these Hillocks broad, bringing them up tapering to the top, where they leave a small hollow pitt, in which they lay their eggs; and when they either lay or hatch their eggs, they stand all the while, not on the Hillock but close by it, with their Legs on y^e ground and in y^e Water, resting themselves on the Hillock, and covering the hollow nest upon it with their Bodies. Their Legs are very long, and building as they do upon the ground, they could neither draw their Legs conveniently into their Nests, nor sit down upon y^m otherwise than by resting their whole Bodies, to y^e prejudice of their Eggs, or Young, were it not for this rare contrivance.

But what my *Pigeons* do, is as worthy to have Remarks made upon it as any of y^e rest. They build their Nests with little sticks Laid athwart one another, at such distances, that while they are so near together, as to prevent their eggs falling through, they are yet so far asunder that their eggs may feel the cool air coming at th^m. Now the REASON for this Architecture! 'Tis this; their Bodies are much hotter than those of other Birds, and their Eggs would be perfectly addled by y^e Heat of their Bodies in y^e Incubation, if y^e *Nests* were not so built, that ye cool air might come at th^m to temper [th^m].

If Dr. More¹³ in his Triumphs over Atheism took y^e Eggs of Birds, for considerable Ingredient of his *Antidote* against that madness, and if Dr. Cheyne¹⁴, from y^e subject of these Eggs, did well to take this noble Flight, *it is impossible duely to consider those things, without being rapt into admiration of y^e Divine Architect*; you will give me leave to add, that y^e management of o^r Birds cannot but compell us into the Sense of an intelligent Being, who has imprinted on those little Animals a Disposition to actions of so agreeable a Tendency.

I know not, what well to make of an odd Relation published among you, a few years ago, but so well attested, that a very pious & worthy man wrote a large Treatise upon it, entitled *Vox Corvi*:—which affirms that a *Raven* perching on a steeple & thence turning towards a Quarrelsome Neighborhood was heard very audibly and articulately to utter these words, *Look into the Third of the Collossians*, and the *Sixteenth*. But this is very certain, *Ask the Fowls of y^e Air & they shall tell thee*. There needs no Genius to take possession of o^r Birds that we may hear y^e Admonitions of Piety, and Exhortations to Believe and Adore an Infinite God intelligibly enough proceeding from y^m.

I am glad, that from y^e Wing of one of y^m I am furnished with that Engine; wherewith I may now assure you that I am, with very great Respect, Sr,

Your

[COTTON MATHER]

The writer desires to express his thanks to Mr. Allyn B. Forbes of the Massachusetts Historical Society for permission to publish the above manuscripts, and to Dr. Gilbert H. Doane, director of the libraries of the University of Wisconsin, for numerous favors including a clue to the above manuscripts.

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13. MORE, DR. HENRY. *A collection of Several Philosophical Writings: Antidote Against Atheism*, Etc. 4th ed., London, p. 67, 1712. ". . . I demand further, what is it makes the Bird to prepare her Nest with that Artifice, to sit upon her Eggs when she has laid them, and to distinguish betwixt these and her useless Excrement? Did she learn it of her Mother before her? . . ."

14. CHEYNE, GEORGE. *Philosophical Principles of Religion*. Ed. 2, London. Part I, chap. 48, p. 359, 1715. "It is very remarkable, that those Animals, Plants and Minerals, that are of most use . . . are more productive of their kind than others, and are found in most Places. . . . Thus Hens, Geese, and Turkeys are more Productive than Crows or Jackdaws, and Conies, and Hares, than Foxes or Lyons; thus a Crane, which is but scurvy Meat, lays but two eggs, and the Alca and some other Sea Fowls, but one, whereas the Partridge and the Pheasant hath Fifteen or Twenty, and those which lay fewer, and are of most value for Food, lay oftner, as the Woodcock and the Dove."

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"LEFT-HANDEDNESS" IN PARROTS¹

BY HERBERT FRIEDMANN AND MALCOLM DAVIS

HAVING frequently observed the parrots in the bird house of the National Zoological Park in Washington at time of feeding, it occurred to us that many of the birds had a marked tendency to use the left foot almost exclusively in the grasping of food. It was thought worth seeing if this peculiarity were individual, specific, or characteristic of psittacine birds generally. In captivity, a parrot, if fed on the floor of the cage, will descend from the perch, grasp the bit of food desired (such as a small piece of apple or carrot) with one foot, and then climb to the perch with the morsel held tightly in the foot, using the bill as a grasping organ to aid in climbing. Upon reaching the perch, the bird then will raise the food to the beak, holding it all the while with the toes, and proceed to eat in this fashion. This mode of feeding is common to parrots generally, and is a familiar act to observers of these birds.

In order to determine the degree of left- or right-handedness, if any such differential use of the foot exists, we selected twenty birds, all caged under uniform conditions. At the morning feeding time (nine o'clock) we introduced into each of the cages a slice of apple about two inches long and a quarter of an inch wide. This food was placed on the floor in the front center of the cages where it was equally approachable by the birds from both the right and the left sides. We then stepped back and recorded the action of the birds. It should be said at this point that none of the birds was shy or nervous; all were used to people and to the regular feeding methods. Several days later the test was repeated, using the same birds but substituting an equivalent slice of carrot for the apple. Parrots chew and obtain the juice from carrots, and it is practically necessary for them to use the feet when eating. About a year later another series of tests was given (two of the birds had died in the interval) with very similar results. In no case did we observe any shifting of food from one foot to the other. Once the food is grasped, it is eaten from the original foot or is dropped on the floor of the cage. Both the apple and the carrot feedings were repeated, so that in all each bird was given 20 tests. On one occasion bread was used, but this proved unsatisfactory, as parrots soak bread in water before eating it, and the birds took the bread in the bill, not in one foot, walked to the drinking fountain, submerged the food in the water, and ate using the bill only.

The twenty individuals tested represented sixteen forms, all typical, hardy, "zoo parrots," species commonly found in collections. The birds used, and their reactions, are tabulated herewith.

¹ Published by permission of the Secretary of the Smithsonian Institution.

<i>Species</i>	<i>Number of times tested</i>	<i>Number of times used left foot</i>	<i>Percentage of left- handedness</i>
<i>Amazona amazonica</i>	20	15	75
<i>Amazona auropalliata</i>	20	14	70
<i>Amazona auropalliata</i>	20	13	65
<i>Amazona auropalliata</i>	20	19	95
<i>Amazona auropalliata</i>	20	17	85
<i>Amazona oratrix</i>	20	15	75
<i>Amazona festiva</i>	20	7	35
<i>Amazona barbadensis</i>	10	5	50
<i>Amazona albifrons</i>	20	12	60
<i>Amazona viridigenalis</i>	20	19	95
<i>Coracopsis nigra</i>	20	6	30
<i>Psittacula longicauda</i>	20	13	65
<i>Ara severa</i>	20	16	80
<i>Ara maracana</i>	20	12	60
<i>Ara macao</i>	20	20	100
<i>Aratinga leucophthalmus</i>	10	10	100
<i>Tanygnathus megalorhynchos</i>	20	1	5
<i>Brotogeris jugularis</i>	20	20	100
<i>Brotogeris jugularis</i>	20	20	100
<i>Brotogeris jugularis</i>	20	20	100

From this table it may be seen that the percentage of left-handedness exhibited by the birds as a whole is 72.2 per cent, that three-quarters of the individuals showed a definite left-"handed" tendency; that one species, represented by three individuals, *Brotogeris jugularis*, was 100 per cent left-handed. One of us (M. D.) has one of these little parrots in his home. It is very tame and is an ideal pet. A very large number of feeding observations show it to be consistently 100 per cent left-"handed." Of the genus *Amazona*, seven species show 66.97 per cent left-handedness, while the ten individuals involved are 70.5 per cent left-"handed." Of the genus *Ara*, three individuals representing as many species are 80 per cent left-"handed." *Tanygnathus* was the most right-"handed" of the birds observed, using its right foot in 95 per cent of the feedings.

Parson ('Lefthandedness, a new interpretation,' 1924, especially chapters V and VI, pp. 45-69) reviews all the theories that have been put forth to explain handedness in humans. Briefly, the factors that have been assumed to be important in these explanations are as follows (many obviously not applicable to birds at all): (1) habit, (2) nursing and early education, (3) visceral distribution and the displacement of the center of gravity, (4) primitive warfare (weapon held in right hand—in itself a result rather than an explanation of right-handedness!), (5) inequality of blood supply of the brain, (6) asymmetrical origin of the subclavian arteries, (7) superior development of one cerebral hemisphere, (8) ocular dominance (handedness de-

pendant upon eyedness). He gives a very extensive bibliography and it is significant that very few of the titles relate to any animals but human. Although Parson inclines to favor the theory of ocular dominance, the evidence, even in humans, is by no means one-sided, and we may be consoled with the conclusion of earlier writers that, " . . . no solution is better than one or several that are erroneous."

Washington, D. C.

THE SONG OF KIRTLAND'S WARBLER

BY HAROLD H. AXTELL

IN late May, 1937, while assisting Mr. Albert R. Brand, I had the good fortune to accompany him and Dr. Arthur A. Allen of Cornell University on a trip to Michigan for the purpose of making sound recordings, photographs, and field studies of Kirtland's Warbler (*Dendroica kirtlandi*). When we confessed ignorance as to where we might hope to find these birds, four of Michigan's ornithologists volunteered to lead us to a colony in Crawford County originally discovered in 1922 by Norman A. Wood. So, under the guidance of Miss Margaret E. Gross, Secretary-Treasurer of the Michigan Audubon Society, Mrs. Marguerite Baumgartner, a former student of Dr. Allen's, and Mr. and Mrs. Theodore Peterson, ardent bird students, we were taken to the jack-pine country near Grayling where a colony of six or more pairs of Kirtland's Warblers inhabited an area about a half-mile square. The songs and singing habits of these birds were studied throughout most of the day on May 27 and the morning of May 28. A more detailed analysis of the song was made from our recordings upon our return to the Cornell University Laboratory of Ornithology.

May 27 was clear all day. The Kirtland's Warblers sang most regularly during the first three or four hours after dawn, but there was a great deal of song well distributed throughout the day. The dawn of May 28 found the jack pines shrouded in dense fog. Only an occasional burst of song was heard until sometime after the sun had risen and the fog was clearing away, when the concert finally began at about six o'clock. Even at this, the nest-building season, there were frequent periods during the day when no sound was heard for several minutes from any of the six or more males. If any one individual was observed constantly for some time, it was noted that there were frequent intervals of silence between periods of singing, even in the early morning. There seemed to be little predictability as to the length of these singing periods or the intervals between them. After a period of silence lasting from half a minute to an hour or more, a bird might sing two or three repetitions of its song or might remain vocal for more than half an hour. During the singing period the song, itself less than two seconds in length, was commonly repeated with considerable regularity at intervals of from eight to twelve seconds. But here, also, some irregularities might frequently be injected into this timing.

At this season, each male did a great deal of his singing while patrolling his territory, sometimes alone, at other times accompanied by his mate. Her presence or absence on these tours did not seem to determine whether or not he sang. I observed one singing from a stick within a foot of the

ground and another nearly fifty feet up in the tip-top of one of the tallest trees in his territory. The greater part of the singing was done from the branches of the dense growth of ten-foot-high jack pines, perhaps several songs from one branch and only one song from the next, while the bird fed between. One individual interspersed preening with rather evenly timed singing while perched nonchalantly almost within arm's reach of me. Any dead tree, rising above the level of the pine-tops, seemed often to influence a bird to perch and sing from one of its higher branches, sometimes for several minutes, whether the tree were near his nest or in the farther reaches of his territory. On a later trip through the same part of his domain, the bird might choose to do his singing from a different dead tree nearby, or might ignore such high perches in that vicinity until a later round. During observations at two nesting sites, the approach of the female with nest material was invariably heralded by a resumption of song on the part of the male who accompanied or slightly preceded her and continued to sing a few yards away until she had completed her work on the nest, when he usually became silent and flew away with her.

In the case of one male whose peregrinations were noted for several hours, there was certainly no set route, even in a general way, by which he went about his territory. The major part of the evidence in the cases of the others in the colony would lead one tentatively to the same conclusion. Even more decisively was it possible to conclude that the three males most carefully observed, did not have favorite song perches. Even in the case of one male that usually (but not always) did his singing in a certain nearby dead tree while the female was working on the nest, he showed no preference for any particular branch or part of a branch, but would perch anywhere on the tree, although he used this general location over and over again. All these observations were made early in the nesting season. Perhaps as the season wears on, the Kirtland's Warblers may become habituated to specific song perches, since Leopold says (Auk, 41: 44-58, 1924), "It appears that each male has a favorite perch, generally a dead branch of some description on a tree somewhat taller than the surrounding short jack-pine and to this he returns both before and after feeding, to sing."

Before discussing *what a bird sings*, we must come to the realization that there is another, perhaps equally important phase of the study of bird song; that is: *what we hear*. It is a thoroughly established fact that there is a tremendous degree of variation in the inherent capacity of different people to count notes when delivered rapidly as in a Kirtland's Warbler's song; also to determine changes in pitch. As we grow older (starting in our early twenties) our hearing for very high tones diminishes. It is the overtones in any sound that determine its quality, and these are mostly high-pitched. When our hearing for these high overtones fails, we become incapable of

hearing quality as others with younger ears hear it. We seem to note resemblances of tone which do not exist for them. So with these individual differences in our hearing, we may in an extreme instance have two people listening to the same warbler song, each hearing it with equal intensity, but with one hearing four notes, the other hearing twelve. Neither of them can hear what the bird actually does with its voice. As revealed by a study of the film recording, a Kirtland's Warbler may sing more than a hundred notes in a second, most of which follow one another too rapidly for any human ear to distinguish. To make matters worse, the quality may sound to one of the listeners like that of an oriole, to the other like that of a Yellow-throated Warbler, whereas to a more 'average' listener, it will sound like neither. Then there is the simple psychological factor of suggestion or first association by which we hear a bird song for the first time and are immediately impressed with how much it reminds us of this or that bird, and thereafter, because of this initial prejudice, we cannot understand how other people can say that it sounds more like something still different. Bringing our hearing under scientific control seems to be at best an especially difficult accomplishment. Then there is the matter of syllabication. Since vowel and consonant sounds are not produced by birds in the same way that they are by man, most of them cannot be exactly reproduced by man-made vocal sounds. Hence there may be several possible syllabic interpretations of a bird sound, all of which may be almost equally close to what the bird actually utters. The syllabication of the Kirtland's Warbler, in particular, is in most cases not very distinct. Although it is my opinion that too much reliance has been put on syllabication as a means of describing bird songs, one must not jump at the conclusion that it is of no value. A well-chosen syllabication may describe more than it seems. The choice of consonant sounds often gives a subtle suggestion of the quality, and correctly chosen vowel sounds indicate relative pitch, from \bar{e} , the highest tone, down through the shorter and broader vowel sounds to the lowest tone \bar{o} . Whistling from your highest to your lowest possible tones will illustrate how this correlation between vowel sounds and relative pitch is almost inevitable in a whistled tone. It will be noted that a *w*-sound indicates an up slur, *y* a down slur. The most important thing to remember in applying someone else's syllabication to a song is: interpret the syllables freely. You may even have to add or subtract syllables in order to make it fit.

This brings up the next point that I wish to stress. There are undoubtedly many who, having heard the rapidly articulated jumbles that constitute the songs of Kirtland's Warblers, would say, "They all sound the same to me." These students may be fortunate in that they catch only the main features in the song, including most of those that are typical of the species. They have the whole song in a nutshell, as it were, while some of the rest of

us are trying to accomplish the same end by putting together details to which they were deaf. All of us, however, may better understand any whole if we have a knowledge of its parts.

The Kirtland's Warbler as a species does not have just one song of so many notes and a certain syllabication, nor does it have just two such songs, nor is it limited to several distinct songs. Not only does an individual sing differently from any of his neighbors, but he changes his own song several times each day. Even while singing essentially the same song, a little perhaps accidental variation is indulged in now and then, such as the omission or interjection of one or two notes, slurring a couple of notes usually sung separately, variations in relative pitch of one or two notes, and a gradual shifting in key of the song as a whole through a range of nearly three tones. Most of these minor variations would not be twice repeated in the same way, but are apparently unintentional when they occur. Occasionally, however, they would constitute a new variation which the singer would retain for a time. More commonly these more enduring revisions would involve a sudden shift in pitch or in rhythm or both of an entire group of notes in the song. Then this would be repeated several times or through several singing periods, in some cases for several hours. It was my observation that when a new variation was selected for its share of repetition, the previous song was not again used. A day and a half may be too short a span of observation to warrant calling this a proved fact, but if further observation shows this to be true, as I strongly suspect it will, then even a single individual Kirtland's Warbler is not a creature of several distinct songs, but of an almost infinitely varied repertory, simply following his musical whims and fancies. However, in the variations that have come within my experience, certain general characteristics may be noted as perhaps diagnostic.

The *loudness* of the song is one of its most outstanding characteristics. In the bird's desolate jack-pine haunts it may be heard from a quarter to a half mile. Its liquid, bubbling quality, and its lively, emphatic manner of delivery seem to be invariable features. The quality, and frequently the style of the song, bear a remarkable resemblance to that of the Northern Water-Thrush and sometimes to that of the House Wren.

Norman A. Wood (in Chapman, F. M., 'Warblers of North America') states that the songs of the Kirtland's Warbler "have the clear, ringing quality of the Oriole's." But Leopold (l. c.) found that "neither on this occasion, nor during our entire stay, was any member of the party able to detect anything suggesting the Oriole." My observation was similar to that expressed by Leopold. Blackwelder (Auk, 3: 360, 1886) should not be mentioned as likening the quality of this warbler's song to that of the Oriole. Let us look closely at his statement about the song being "almost like an

Oriole's in the depth of its tone—a contrast to the high notes of many warblers." The expression "depth of tone" as used correctly in reference to sound, means lowness of pitch, and does not refer to quality. If there is any doubt as to Blackwelder's meaning, a reference to the last phrase in the above quotation should assure us that he was writing about pitch, not quality.

The Kirtland's Warbler has the lowest-pitched song of any of the eastern *Dendroicas*. The average pitch of its notes is about A flat in the highest octave on the piano. This note was the median as well as the mean, for the highest tone I noted was the D above the piano, the lowest was D, an octave lower. As Text-fig. 3 shows, apparently some still-lower tones were sung which were inaudible to my ear but which were recorded on the film.

I am indebted to the method developed by Aretas A. Saunders ('A Guide to Bird Songs,' 1935) for graphically writing down bird songs in the field. In this system the notes heard are represented by dashes and lines the horizontal length and spacing of which show the time and rhythm, and the relative vertical positions signify their pitch relationships much as do notes on the musical staff. At the left of the graph is placed a letter denoting the pitch of the notes on a horizontal line opposite. Degrees of loudness are shown by drawing heavier lines to represent louder notes. Words descriptive of the quality may be written above the graph, and the listener's interpretation of the syllabication below it. The accompanying graphs of several songs made by the Saunders method show some of the considerable variation that occurs, as well as the general pattern which persists throughout all these variations and seems to be diagnostic. I would describe this pattern as follows: the melody is introduced by from one to four staccato notes, usually on the same pitch, followed by from one to three staccato notes on a higher pitch, and concluded with from one to five notes which are usually slurred but may less often sound staccato. A common form of ending sounds similar to that of the Northern Water-Thrush and the Mourning Warbler. The songs are from four-fifths to one and three-quarters seconds in length, and normally increase in volume, speed, and emphasis toward the end.

Undoubtedly there must be individual Kirtland's Warbler songs which will not fit this pattern. Since my own field acquaintance with the bird is relatively limited, and I was curious to know how generally this song pattern is followed by individuals heard by other observers, I have looked up descriptions given by them. After attempting the rather uncertain interpretation of the syllabications by the choice of vowels as probably indicating relative pitch, and the presence or absence of *w* and *y* sounds as possibly denoting (when present, at least) slurring or its absence, it seems reasonably possible to conclude that most of the songs represented by their syllabica-

tions may fit into the pattern. The syllabifications given by other observers follow:

Arnold (Auk, 21: 488, 1904): *trp, trp, terp, terp, terp, ser-wit, er, wer.*

Leopold (Auk, 41: 44-58, 1924): *chip, chip-chip, chip, chip—chip, chip, wheeou.*

The accompanying verbal description states that the middle group of notes is higher than the first, and the third group still higher, ending with a slurred note.

Wing (Wilson Bull., 45: 72, 1933): *ba tu tu weet weet* (an exceptionally well-chosen syllabication); *butte butte weet weet weet.*

Wood (in Chapman's 'Warblers of North America'):

chip-chip-che chee chee-r-r-r.

wichy-chee-chee-chee-r-r.

ch-ch-che-che-che-ah.

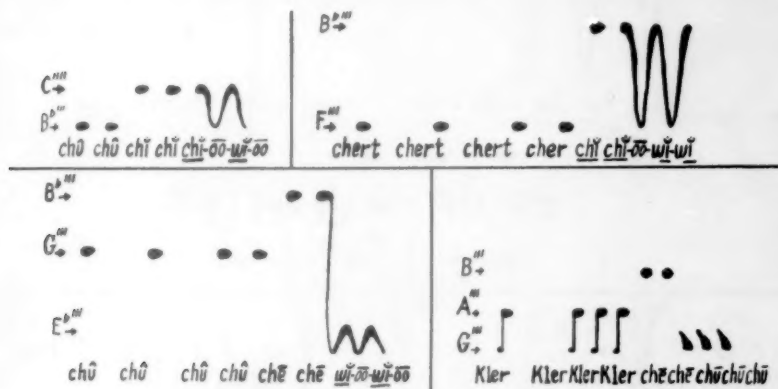
che-che-che-chee-wich-a-a.

tsip tsip, chze-chze-e-e.

Probably only a person who has himself heard and tried to select the best (if any!) possible syllabication for the sound can appreciate how *weet weet* and *r-r* may possibly both refer to the same sound,—appearing in my graphs as *wi wi*, well illustrating one of the weaknesses of syllabication when used by itself. Even if most of these syllabified songs may be imagined to fall within the pattern, songs mentioned by two or three other writers most certainly do not. It has been written (Roberts, T. S., 'Birds of Minnesota,' p. 243, 1932) that the song of the Kirtland's Warbler suggests that of the Maryland Yellow-throat. This would have to be a very different variation from any I have heard or have seen described by others. I doubt if a large proportion, even of southern ornithologists, would note a striking resemblance of the song to that of the Yellow-throated Warbler as Hoxie (Auk, 3: 412, 1886) did. Perhaps the most freakish song of all was noted in Alabama by Saunders (Auk, 25: 422, 1908) where a Kirtland's was reported singing a song rather like that of a Black-throated Green Warbler. The described pattern was very different from what I assume to be the normal style. Perhaps this individual, several hundred miles from the rest of his brethren, had not been able to hear the songs of his own kind and had been forced to learn his melodies from other species. If the pattern is as closely followed in this species as it seems to me to be, then it should be reasonably diagnostic. The Yellow, Blackburnian, Yellow-throated, and Chestnut-sided Warblers and Redstart, all have variations that occasionally fall within the fringe of the Kirtland's pattern, but are rarely sufficiently typical of that pattern to create confusion. Besides, these warblers have higher-pitched, weaker, thinner, and more sibilant voices. The Northern Water-Thrush

and the House Wren are the most likely sources of confusion. The Water-Thrush's song starts high and descends; the Kirtland's starts low, goes higher, and may end either high or low. As compared with the wren, the warbler's song is shorter, of fewer notes, and has a more definite beginning and ending.

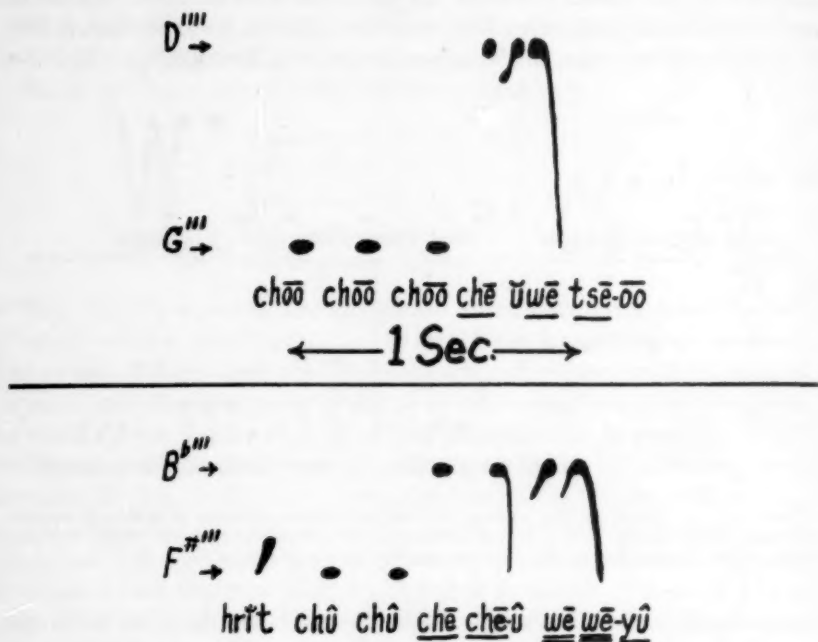
Since experience has shown that the Kirtland's Warbler is usually located by means of its song, some foreknowledge of what one should listen for is desirable, in fact almost necessary, for the seeker after the bird. To one of limited experience in learning bird songs from graphs, I would suggest that he concentrate attention on the upper-left graph in Text-figure 1. This is a



TEXT-FIG. 1.—Graphs of four songs of Kirtland's Warblers, showing variations in pattern. The song has a quality similar to that of the Northern Water-Thrush—a "lively bubbling whistle" or a "liquid gurgle," loud and low-pitched for a warbler.

short, simple, and typical song. Since this song lasted only four-fifths of a second, the syllables should be pronounced very rapidly, and those that are underlined should be strongly emphasized. A glance at the other graphs will show that notes may be added to any part of this theme, but the general pattern remains essentially unchanged. The upper-right and the lower-left graphs in Text-figure 1 show two consecutive variations in the singing of one individual. In this case the rhythm did not change. The difference lies in the relative pitches of groups of notes within the song, and although rather strikingly apparent on paper, this is difficult to detect with the ordinary type of superficial field-listening. The lower-right graph in Text-figure 1 is of a song that sounded remarkably like that of a House Wren, especially from a distance. The upper graph in Text-figure 2 shows a type of ending not heard from others in the colony. This ending is rather reminiscent of that in a Magnolia Warbler's song. The similarity begins and ends on that feature, however.

Further variations in the song of one individual are presented in the upper-left graph of Text-figure 1, the lower graph in Text-figure 2, and the graph (note the larger scale) in Text-figure 3. These are all songs of one male, given at different times during our visit. A critical study of these three variations will show that although very different, they more resemble one another than they resemble any of the other songs represented by the other graphs which are those of other singers. Again, a casual listener

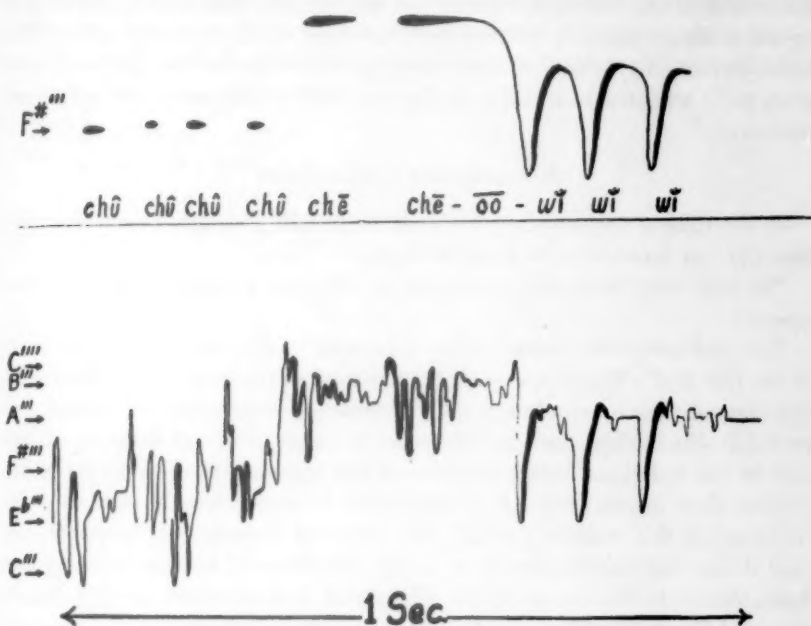


TEXT-FIG. 2.—Two more song variations of Kirtland's Warbler.

might readily overlook the existence of this variation. The difference, as heard in the field, is not striking unless one has a fairly good musical ear and listens attentively. If the singer gave one variation right after another, the difference would be more noticeable by contrast, but this seldom occurs.

It will be noted that the scale used in Text-figure 3 is much larger than that for the first six graphs. These two graphs of the same song show comparative results from two different methods of study. The upper graph represents how this particular song sounded to me. In order to draw the lower graph a photographic enlargement was made of the motion-picture film on which the song had been recorded, so that a single song as represented on an eighteen-inch strip of film was enlarged to a length of about fifteen

feet to simplify its study. The pitch was determined for each one two-hundredth part of a second, and the lower graph was made from these figures. Relative volume, as indicated by the height of the peaks of the sound waves shown on the film, is represented on the graph by the heaviness of the lines. The result is a highly detailed picture of the bird's musical performance, in which some rather surprising facts are revealed. Pitch changes of several tones in less than one-hundredth of a second—far too fast to be caught by the



TEXT-FIG. 3.—Graphs of a single song of Kirtland's Warbler, showing comparative results from two methods of study. Upper figure, a graph as made by ear using Saunders's method; lower figure, a graph as made from analysis of sound track on film for the same song.

human ear—are a typical feature. Notes that sound staccato turn out to be merely the louder portions of a long, rambling slur. We observe that a tone consuming less than one two-hundredth of a second of time may be heard by the human ear unless it is immediately preceded and followed by other notes, conditions under which a sound equally loud and of three times the duration will not be distinguished at all, even by a 'quick ear.'

Perhaps most surprising of all is the fact that out of this apparent jumble of rapidly shifting pitches, one is able to determine which of these pitches he hears by selecting on the graph the most heavily shaded lines. Where the pitch slurs rapidly up and down, we hear only the top notes in the slurs, even though the volume may remain the same throughout. By checking

from the upper to the lower graph, it will be observed that the notes in the upper correspond in a general way to the most heavily marked areas in the lower graph, thus illustrating that although the human ear is a relatively imperfect recording device and misses many details, it does pick out the essentials.

In our field studies of the Kirtland's Warbler only one type of call-note was heard. It was loud and low-pitched for a warbler. It closely resembled the smack of the Brown Thrasher, but was slightly less loud. Likening it to the common scolding note of the Oven-bird would be better still. The syllabication may be said to vary from *tsyip* to *tshyook*. The birds did not seem to be addicted to scolding during our visit, so this note was not heard frequently.

SUMMARY AND CONCLUSIONS

At the time of nest-building the male Kirtland's Warblers under observation did not have favorite song perches.

The bird may have different habits at different periods of the breeding season.

The confusion and contradictions appearing in the literature on the song of the Kirtland's Warbler, especially in respect to the quality, syllabication, and observations on number of song variations possessed by the species, are probably due in most cases to differences in the musical and auditory acuity and in the individual interpretations of the various hearers who have described their impressions. It is impossible to give a wholly objective description of this warbler's song. My personal impressions, however, are that it does not have a quality at all like the Oriole's, nor can I detect any resemblance to the songs of the Maryland Yellow-throat or the Black-throated Green Warbler. To my ear it most nearly resembles the songs of the Northern Water-Thrush or the House Wren. Nearly all the published syllabications fit fairly well; none (my own included) is wholly satisfactory.

Each male observed changed his song now and then, and was not noted to use a song again after changing from it. Songs of one individual were always different from those of others in the colony. The song of the species may be almost infinitely varied, usually within the limits of a definite but general melody pattern, which appears to be diagnostic in most cases.

The song has notably more carrying power and a lower pitch than most warbler songs.

Anyone, however poor his musical ear, should be able easily to identify all reasonably typical songs (probably over 99 per cent) of Kirtland's Warbler, if acquainted with the essential facts mentioned herein, especially if he knows the songs of the Water-Thrush and the House Wren.

A study of the sound track, as recorded on motion-picture film by Mr.

Brand, shows that a Kirtland's Warbler song of one second's duration is an almost continuous slurring up and down, with varying degrees of loudness throughout. More than a hundred up or down slurs may occur in that one second of time, but no human ear can catch more than a small fraction of all these rapid changes of pitch.

There is much yet to be done in the advanced study of the Kirtland's Warbler's singing by some musical ornithologist. My own effort has been directed largely toward clearing up some of the confusion in the literature, presenting a more analytic and graphic description of the song, along with a number of elementary observations on the singing habits as observed at the beginning of the nesting season.

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RECENT OBSERVATIONS ON THE GREENLAND WHEATEAR

BY JOHN RIPLEY FORBES

ON JUNE 24, 1937, the MacMillan Arctic Expedition under the leadership of Commander Donald B. MacMillan sailed from Gloucester, Massachusetts, for Baffinland. I had the good fortune of serving as ornithological collector and taxidermist for Bowdoin College on this expedition.

On August 3, the *Gertrude L. Thebaud* lay at anchor in a barren, windswept harbor at Brewster Point, Baffinland, on the left-hand shore of Frobisher Bay, known as Hall Peninsula. Our anchorage was at the extreme end of Barrow's Peninsula, also the entrance of Peterforce Sound. Brewster Point is a small point of land surrounded by barren islands, which make a fine harbor and one that we could leave only at high tide. On the point was a settlement consisting of five tents where a small colony of Eskimos lived. Nearby was a deserted house which had formerly served as a trading post for the Hudson's Bay Company. Except for this deserted shack and the Eskimo tents, nothing else was visible on the point. A short distance from the settlement the rugged country became higher and except for small alpine plants and moss, little vegetation was evident. The rocks were covered with large and small boulders showing glacial action. Upon reaching the top of the cliffs one could see the country spread out, with numerous small and large pools scattered about.

While on a field trip but a short distance from the Eskimo settlement, I ran across the nest of an Eider Duck and, while looking at it, noticed several small birds flying about nearby. They had a call note which I had never heard before; it might be described as *chack chack*. I soon made these birds out to be the Greenland Wheatear (*Oenanthe oenanthe leucorhoa*). There were several flying about a short distance from me, halfway up a hill near a small valley surrounded by cliffs. I found the birds rather wary and difficult to approach. They would fly from one rock to another, and they had a habit of perching on the most prominent places such as the tops of boulders. They were shaped somewhat like a Bluebird, but smaller, with olive brown above and light cinnamon-brown under parts. Their wings were brown and the most prominent field mark was the white rump which, with the white along the sides of the tail, in contrast to the brown central tail feathers and the terminal band, made an inverted letter T on a background of white. One bird observed and later collected, was a male in typical plumage. Its upper parts were gray rather than brown, its wings black, and its cheeks were black with a white streak over the eye separating the black cheek-patch from the gray of the head. Its tail was black and

white rather than brown and white and the bird showed slight traces of moult.

As many as four of these birds were seen at one time. They would flit from place to place, usually perching atop a large round boulder or at the summit of a cliff where they could be seen jerking their tails as they flitted along from place to place, uttering their sharp calls: *chack chack*. One of these birds was seen with its bill full of insects and I felt sure that the young or a nest must be nearby. After watching this bird for some time I was finally rewarded by hearing the faint sound of young calling as the bird fluttered about near the top of a cliff. It did not stop but flew over the top of the cliff to a nearby boulder. Having heard the young I went over to the cliff and after a long examination, located the nest tucked in a crevice in the cliff about eight to ten feet high. There were four well-grown young about ready to leave the nest and a fifth bird was out of the nest farther back in the crevice of the rock. The young left their nest before the day was over, so I had found the nest none too soon. It was constructed of dry grasses and beautifully lined with the white feathers of the ptarmigan. The entrance to the crevice was so small that it would not admit my hand through the entrance. The crevice ran some distance back into the rock and, during another visit, I found the young had left the nest on hearing my approach and had retreated into the rock, to return after I had left. After stalking for some time the bird which had led me to the nest, I collected it and found it to be a female in the process of moult. Then, upon hearing the welcome sound of the cook's bell from the *Thebaud*, I returned to the ship to report my find.

After supper, I returned to the wheatear's nest with another member of the staff. We found the young birds had left the nest, and two of them were hiding among the rocks nearby. One was collected and another captured alive to be brought back to the ship for pictures. We then took pictures of the nest location and of the young birds which we had captured. A total of nine birds was observed in this one region during the day. Five young were found while two adult birds, whose actions indicated that they were the parents of these young, were seen frequently about the nest. Two other adult birds had been seen with these two, making a total of four adults and five young in the region of the nest. I believe there were also two other adult birds but I could not be certain of this for I did not see more than the four at the same time. However, if this were so, it would mean six adult birds and five young.

The following day, upon returning to the nest location, I removed the now empty nest by sections, for it was impossible to remove it otherwise from so small an entrance. The dry grass made up the larger part of the nest and the lining of ptarmigan feathers the rest. While taking some pictures we captured another young bird near the nest. A male bird in fine plumage

with but a slight trace of moult was collected as it flew about the top of the cliff where the nest was. Two adult male wheatears were collected nearly a mile and a half distant from the original location. However, no evidence of another nest or of young could be found in this region.

On returning to our wheatear nest, we saw the two remaining young under nearby rocks. Several adult wheatears were flitting about, but at no time would they allow us to approach them. With a skin series of three young wheatears, male and female parents of the young, and two adult wheatears collected a mile and a half from the original nesting site, we set sail from Brewster Point to continue our voyage. Leaving at least two young and two adults (and possibly two additional adults which we will not count in view of the fact we are not positive), at Brewster Point, we had identified a total of eleven wheatears.

The Greenland Wheatear is a common European bird, which breeds in the arctic zone from Ellesmere Land and Boothia Peninsula, east to Greenland and Iceland and south to northern Quebec. It winters in western Africa, migrating to its breeding grounds in the Arctic from Africa through France and the British Isles and is a common migrant in the British Isles.

Upon examination of 'The Auk,' I find numerous records of birds that have been seen or collected over a rather wide range. One specimen was found at Boulder, Colorado, in 1880. In 1885, three specimens of this bird were collected on the northern shore of the Gulf of St. Lawrence and represent a possible breeding record. Napoleon Comeau of Godbout, Quebec, tells of their probable breeding near there. At New Orleans, Louisiana, a male bird in winter plumage was shot within the city limits on September 12, 1888. Another specimen, now in the American Museum of Natural History, was taken on Long Island, New York. Two or three of these birds were seen and one was collected at Jamaica, Queens County, New York, in 1885. Bigelow, in 'The Auk' for 1902, states that this bird nests near Nachvak, Labrador, for the Hudson's Bay Company factor had nests which he had taken there. Bigelow did not, however, observe this bird while there. In 1920, Charles R. Lamb observed a wheatear at Gloucester, Massachusetts. In 1920, a bird was seen by Witmer Stone in eastern Pennsylvania; while in 1932 observations by Hutt on the wheatear at Belle Isle, Labrador, are reported in 'The Auk.' According to the literature it is evident that the wheatear has been observed over a very wide range, from as far south as Bermuda and Cuba to as far west as Colorado in various States and in New Brunswick, Labrador and Baffinland, Canada.

Although the Greenland Wheatear is listed as the rarest bird in Baffinland, I should say that its solitary habits, its wary nature and the type of habitat where it dwells, have made it seem rare; to give a more accurate opinion one would have to spend several summers in the region of Baffinland. I believe,

however, from our experience that the Greenland Wheatear is not as rare in Baffinland as ornithologists have been lead to believe. The very fact that we were at Brewster Point for five days and it was not until the fourth day that I discovered the bird, may in some manner explain its rarity, for many of us during this time had passed through and about the region where the wheatears were discovered without finding them. I noticed during our observations that these birds were seen in a very limited area and once beyond this location there was no sign of them. Therefore it would seem that since we found eleven of these birds in one location, they may very well be a more common nesting species in Baffinland (which is geographically ideal for their nesting) than we have heretofore realized.

Of the seven specimens collected, four are in the study collection at Bowdoin College and the three others are in the National Museum of Canada. Their measurements follow:

No.	Sex	Locality	Date	Weight	Length	Extent
				in grams		
1407	Female	Brewster Point, Baffinland	8/6	25	160	305
1411	Male	Brewster Point, Baffinland	8/7	30	155	310
1412	Male, young	Brewster Point, Baffinland	8/7	21.5	120	250
1413	Male, young	Brewster Point, Baffinland	8/7	21	110	230

Lee Museum of Biology

Bowdoin College, Brunswick, Maine

FRANCIS ORPEN MORRIS: ORNITHOLOGIST AND
ANTI-DARWINIST

BY CHARLES A. KOFOID

THE lives, methods of work, opinions, and influences of those who have preceded us in our various fields of investigation have contributed to the background into which our work of today is continuously merging. It is of value to us to follow back along these streams of influences to their sources and by comparison to scan our own trends and that of our science in the light of the past. To these ends I bring before you a unique figure out of the past whose influence in the field of popular ornithology in Great Britain was stimulating, widespread and lasting and whose opinions on the place of natural history in education, on conservation of wildlife, on vivisection, and on evolution, particularly Darwinism, were reiterated widely, and often with emphasis and rancor.

Francis Orpen Morris (1810-1893), a British ornithologist and entomologist, was born near Cork, Ireland, son of Admiral Morris. His paternal grandfather was Captain Roger Morris, aide-de-camp of General Braddock, comrade and friend of George Washington. The grandmother of F. O. Morris was Mary Philipse, sister of Mrs. Beverly Robinson of a wealthy New York family in whose home Washington visited, and, as family tradition records, courted this charming young lady and proposed to her without success, though Washington Irving in his 'Life of Washington' doubts this. In the handsome New York home of the successful suitor, Colonel Roger Morris, Washington stopped, in 1776, on his way to assume command of the Continental Army in Cambridge, and later made it his headquarters in New York even though Colonel Morris was a Loyalist and later fled to England. Fenimore Cooper drew the character of the heroine of his novel 'The Spy,' from that of Mrs. Morris. The second son of this marriage, the father of F. O. Morris, entered the British Navy at the tender age of six. He married Rebecca Orpen, daughter of the vicar of Kelvargan of County Kerry, Ireland. Their eldest son, Francis Orpen, is the subject of this notice. He grew up on the western shores of Ireland where his love of natural history kept pace with his studies of insects and birds. In school he rapidly advanced into the collecting stage, rigging up a moth trap in his bedroom, and adding the rarest of birds to his local list. At Worcester College, Oxford, he made the acquaintance of J. L. Duncan, the entomologist, arranged the insects in the Ashmolean Museum, and began his life-long extensive scientific correspondence. Rather significantly, he loved the classics and hated mathematics. He was devoted to logic, Aristotle's ethics, and Butler's 'Analogy.' In his 'Great Go,' one of the subjects in which he chose to be

examined was books 8 to 11 of Pliny's 'Natural History' in which to his delight, he quite floored his examiner. He took Orders and was appointed throughout his life to parishes in Yorkshire. This environment in the home of the Quakers did little to pacify his irascibility, but seems to have stimulated his zeal for reform. The country-folk rebelled at his energetic efforts for progress in education, sanitation, postal service, and social reforms; for the abolition of stocks for petty offenders and the annual hiring day for servants; and for the installation of a village school and library, so much that he was moved several times in his early clerical career.

His rural environment fitted his avocations as fisherman and naturalist but it was not until he was forty that he launched his intensive activity in publication in ornithology and popular natural history. A list of his major publications in these lines follows:

- 1834. A guide to an arrangement of British birds; being a catalogue of all the species hitherto discovered in Great Britain and Ireland. 20 pp., Longmans.
- 1849. A Bible natural history. Groombridge.
- 1850. An essay on the eternal duration of the earth. 15 pp., Groombridge.
- 1850. An essay on scientific nomenclature. 10 pp., Groombridge. (An attack on species-splitters and an appeal for a board of experts with authority to stabilize nomenclature.)
- 1850-1857. A natural history of British birds. 6 vols., 8vo, Groombridge. 3d edition, revised, corrected, and enlarged, John C. Nimmo, 1891. 4th edition; vol. 1, 1895; vols. 2, and 3, 1896.
- 1851-53. A natural history of the nests and eggs of British birds. 3 vols., royal 8vo, Groombridge. 3d edition, revised, corrected, and enlarged, John C. Nimmo, 1892. 4th edition (edited by W. B. Tegetmeier), 1896.
- 1852. A natural history of British butterflies. Royal 8vo, Groombridge. 6th edition, 1889, John C. Nimmo. 7th edition, 1893. 8th edition, 1895.
- 1856. A book of natural history. Groombridge.
- 1859-70. A natural history of British moths. 4 vols., royal 8vo, Longmans. 5th edition, 1896, John C. Nimmo.
- 1860. Anecdotes of natural history. Longmans.
- 1861. Records of animal sagacity and character. Longmans.
- 1865. A catalogue of British insects in all the orders. 125 pp., Longmans.
- 1870. Dogs and their doings. Partridge.

Morris was a frequent and voluminous correspondent of the 'London Times' and an irrepressible pamphleteer. He had the tenacity of a bulldog and a fixity of purpose which rose in some fields almost to the level of persecution. His correspondence was gathered together at times in part in pamphlet form as in 'The Game Keeper's Museum,' 'Letters to the Times about Birds,' and a booklet on 'Dogs and their doings.'

He had four major antipathies, viz:—feminism; fox hunting and wanton destruction of wildlife; cruelty to animals and vivisection; and evolution as centered in Charles Darwin's 'Origin of Species.' His antipathy to feminism

reached its highest sarcasm when, before a Parliamentary hearing on a bill to authorize the reduction of the population of the English Sparrow in the interest of the farmers whose grain they were charged with destroying, he turned his invective against Miss Ormerod, the long-time economic zoologist of the Government, charged her with utter neglect in observation on the food and feeding habits of sparrows, the use of unscientific hearsay evidence, and suggested that her time and intellect would be better employed if she would go home, sit down, and knit for the worthy poor. His ire was roused to the highest pitch by the fox-hunting squires of the countryside who raced over fields and hedges in a brutal sport which not only destroyed crops and meadows but wrought suffering to the poor victims and brutalized the youth of the land. With equal intensity he assailed the lads and farmers who shot the omnipresent English Sparrows in their fields and orchards and the hunters who baited and slaughtered the visiting gulls.

He combined in one group the anatomists, vivisectionists, and evolutionists for his direst wrath and most continuous assaults. His motive for making this combination was perhaps his antipathy to Huxley, whom he most vigorously attacked. Thomas H. Huxley once replied to his request for answers to his criticisms of evolution suggesting that he study anatomy and physiology in the laboratory for four years and read all of Darwin's 'Origin of Species,' for this information. Morris's reply to Darwin's bull-dog suggested that Huxley take a well-planned course in ethics and logic at Oxford. Since experimental physiology was even then in its vigorous infancy the anti-vivisection movement was well under way. Huxley's elementary textbook of physiology was widely known and this perhaps in the mind of Morris linked him and Darwinism for attack by the incipient anti-vivisection movement. Morris's son in writing of his father's attitude on this subject says: "Certain it is that, of all the forms of cruelty against which he carried on such a long and determined crusade, there was none which he held in greater loathing and abhorrence, none which, in his conviction, was fraught with more dire consequences, than that which is involved in the term vivisection. It would be impossible to describe his feelings with regard to this practice; no words seemed strong enough to express what he thought about it, and therefore no trouble was too great for him to take in his endeavor to influence public opinion against it. He looked upon it as something infinitely worse than any ordinary cruelty. To be in any way a party to the torturing and experimenting upon any one of these was in his eyes to descend to the lowest depths of degradation and cruelty. Rather would he have died a hundred deaths than have had his life prolonged, if such a thing were possible, by any discovery that might be made through the abominations of the vivisection-room.

"Column after column in correspondence to newspapers and magazines

enough to fill volumes, did he write during the last twenty years of his life, besides private letters innumerable, upon this burning subject, never deviating from his uncompromising opposition to the vivisectionists of every shade and colour."

This agitation was followed by a licensing bill for all animal experimentation. He later even petitioned Parliament to limit the extension of licenses for such experimentation to those who had shown valuable results. His 'Curse of Cruelty' (1886), a sermon preached at York Minster, was his swan song on this subject. In it he definitely linked vivisection with atheism, evolution, and Darwinism. Nevertheless, with characteristic inconsistency, he was a great fisherman, caught trout on a barbed hook and doomed them to a lingering death in his creel, and yearly reaped the profits on the sales of his 'Eggs and Nests of British Birds,' which through four editions and forty years was the inspiration and sanction of many a collector and more boys of lesser and greater stature who systematically plundered the nests of birds with resulting distress of the expectant parents and devastation of the rarer species.

His antipathy to Darwinism found even more persistent expression, and, because of his position as a well-known naturalist and his wide acquaintance in clerical, educational, and military circles, probably had some temporary influence as shown by appreciative letters which he copied in the later editions of his anti-Darwinian pamphlets. These writings included his 'All the Articles of the Darwin Faith' (4 editions, 1875-1882), 'A Double Dilemma of Darwinism' (1877) read before the British Association, 'The Darwin Craze' (1880), and 'The Curse of Cruelty.' His long experience as a naturalist seemed not to have given him any insight into the phenomenon of adaptation, the existence of natural selection, or the meaning of an experiment. His Oxford training in logic did not help him to the significance of an hypothesis nor that in ethics to an appreciation of courtesy in argument.

His work as an ornithologist falls into the mid-Victorian Period of widespread active interest in natural history which resulted in a flood of books written by those observant lovers of plant and animal life in the wild. Its underlying motive was aesthetic and the rewards were personal enjoyment and an extension and cultivation of an interest in natural phenomena. Much of it unconsciously was scientifically uncritical and at the best merely factual. Indirectly and socially its value was very great. It contributed to the widely diffused knowledge of and interest in the living world which prepared the way for the placement of the biological sciences in the educational systems of English-speaking peoples. It also afforded the starting point for the rise of realism in literature as seen in the lately emerged literary appreciation of the works of W. H. Hudson, Richard Jefferies, and J. A. Owen. The ornithological works of Morris held a unique and influential position in the

literature of this period. They were sufficiently scientific to command general approval—witness their continuance through four editions from 1850 to 1896—and sufficiently popular to furnish a useful guide to amateurs. Their beautifully colored plates made identification of birds relatively easy for the novice unfamiliar with technical terms of plumage and their gossip notes on occurrence lent zest to the formation of local lists. An inspection of these works shows a rather wide but undocumented use of literature, technical accuracy and completeness in description and comprehensiveness in scope, including, for example, notes on juvenile plumages, food, behavior, habits, habitat, and records of occurrence. The content is factual rather than aesthetic. His 'Nests and Eggs of British Birds' lapses occasionally into poetical quotations, but Tegetmeier's fourth edition brutally elides these in his rewritten text.

This brief survey of the work of this versatile, irascible, dogmatic, and persistent critic and naturalist leaves us with the inference that the net result of his activities was to extend the interest in natural history at a critical period in the history of science and to forward, rather than deter, those movements in civilization and those currents in human thought which he fought and sought to stem throughout his life. He served the useful function of the opposition party.

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SOME FINDINGS OF THE SEMPLE OKLAHOMA EXPEDITION

BY GEORGE MIKSCH SUTTON

DURING the spring of 1937, Mr. John B. Semple generously sponsored a two-months' ornithological survey of Oklahoma. The party of four men (Mr. Semple, Leo A. Luttringer, Jr., Karl W. Haller, and the author) entered the southeastern corner of the State April 19, and established themselves on the Mountain Fork River in McCurtain County, seven miles east of Broken Bow. They spent a week in this well-wooded region, visiting the swamplands south of Eagletown, the Kiamichi Mountains in the northern part of the county, and the banks of the Red River, ten miles southwest of Idabel. Though they encountered fine cypress trees along the Mountain Fork, they did not find the Ivory-billed Woodpecker. On April 25, they motored westward to Murray County, and made their second base at the Cedarvale Tourist Camp. Here they studied the bird life of the forest-clad Arbuckle Mountains for seven days. Leaving Cedarvale May 2, they drove to Indianahoma, Comanche County, from whence they visited the Wichita Mountains, and the rocky hills of southern Kiowa County. They were at Indianahoma seven days. May 9, they established a new base at Cheyenne, Roger Mills County. This section was virtually unknown from the ornithological standpoint, and the four men spent seven busy days visiting the Antelope Hills (along the South Canadian River near Durham), the wooded flood-plain of the Washita River, and the sagebrush country near Strong City. On May 16, the party moved to Gate, Beaver County, at the extreme eastern end of the Panhandle. Here, under the guidance of Mr. Walter E. Lewis, the ornithologists worked the Red Hills, seven miles to the north; the shallow lakes near the Beaver River, three miles to the south; and cottonwood groves along Horse Creek. Three days later (May 19) a sixth base was made at Kenton, at the extreme western end of the Panhandle, a section visited by Semple and Sutton in 1932 and 1933, and again by Sutton in 1936. From May 21 to 24, Messrs. Thomas D. Burleigh and George H. Lowery also studied the bird life of the Black Mesa country, with their base at Kenton.

The author's party moved eastward on May 25 to the Lesser Prairie Chicken country in Ellis County, making headquarters at Arnett. This section Sutton had studied intensively the preceding year. Luttringer left for the East on May 28. On May 31, Semple, Haller and Sutton moved to Buffalo, Harper County, by way of Woodward and Woods Counties, stopping briefly at the spectacular salt plains near Edith. Semple left for the East on June 1.

From June 1 to 12, Haller and Sutton motored extensively through the northeastern corner of the State, collecting specimens principally at the following places: the Edith salt plains, in Woods County; Pond Creek, Grant County; Ceres and Red Rock, Noble County; Mulhall and Coyle, Logan County; the southwestern corner of Payne County, along the north bank of the Cimarron River; Ramona and Copan, Washington County; and Grove and Jay, Delaware County. They left Oklahoma June 12, following highway 66 northeastward through Ottawa County.

During the course of the several weeks of field work 219 species (not counting subspecies) were recorded. Of these the following appear to merit especial attention, either because they have not heretofore been recorded from Oklahoma, or because their status or the extent of their range has not been fully understood. In the author's opinion the expedition's most important work was done in Roger Mills County, where several species formerly thought to breed only in eastern and central Oklahoma, were found as far west as the Texas state-line. The author wishes to express his indebtedness to Mrs. Margaret Morse Nice, whose 'Birds of Oklahoma' (Publ. Univ. of Oklahoma Biol. Surv., 3: no. 1, 1931) has furnished an admirable basis for the present investigations.

TREGANZA'S GREAT BLUE HERON, *Ardea herodias treganzai*.—Ten pairs were found nesting in cottonwoods along the South Canadian River ten miles south of Arnett, Ellis County; clamorous young in the nest were noted May 26.

SNOWY EGRET, *Leucophoyx thula thula*.—Five were seen along the Red River, ten miles southwest of Idabel, McCurtain County, April 24.

YELLOW-CROWNED NIGHT HERON, *Nyctanassa violacea violacea*.—Mrs. Nice (1931, 57) calls this species a "summer resident in northeastern and central Oklahoma." We found a small colony along the Washita River near Cheyenne, Roger Mills County, and collected a male May 13 (Sutton). No eggs were found in the four nests examined on this date, though parent birds were standing among the branches close by. Isolated nesting pairs were observed along a small stream near Ceres, Noble County, June 2.

RUDDY DUCK, *Oxyura jamaicensis rubida*.—Mrs. Nice (ibid., 65) calls this species an "uncommon transient." We therefore wish to record a male and five females seen along the Washita River, three miles west of Cheyenne, Roger Mills County, May 12; several males and females seen on the shallow lakes three miles south of Gate, Beaver County, May 18; and a pair noted on the South Canadian River, ten miles south of Arnett, Ellis County, May 26.

AMERICAN MERGANSER, *Mergus merganser americanus*.—Mrs. Nice (ibid., 65) calls this species an "uncommon transient and winter resident." We therefore wish to record two males and a female seen along the Beaver River three miles south of Gate, Beaver County, May 18.

COOPER'S HAWK, *Accipiter cooperi*.—According to Mrs. Nice (ibid., 71), this species nests in "northern and central Oklahoma and the Wichitas." We found it common in the vicinity of Cheyenne, Roger Mills County, from May 9 to 16, collecting a set of four somewhat incubated eggs on the 13th, and a mated pair and their

three fresh eggs the following day (Semple). In the southeastern part of the State we noted the Cooper's Hawk but once: a single bird along the Red River southwest of Idabel, McCurtain County, April 24.

BROAD-WINGED HAWK, *Buteo platypterus platypterus*.—A pair noted April 23 in the Kiamichi Mountains of northern McCurtain County, eight miles east of Bethel, must have been on their nesting territory, for the birds screamed at us repeatedly. Mrs. Nice (ibid., 74) calls the Broad-wing a "rare summer resident in northeastern Oklahoma."

KING RAIL, *Rallus elegans elegans*.—Haller took a female (laying eggs) near the Cimarron River, seven miles north of Gate, Beaver County, May 17. On the following day a nest with three fresh eggs was found along the edge of one of the shallow lakes three miles south of Gate (Sutton).

UPLAND PLOVER, *Bartamia longicauda*.—A nesting pair with young were noted by Haller and Sutton near Quapaw, Ottawa County, not far from the Kansas state-line, June 12. The species was abundant as a transient in Comanche County from May 3 to 7.

WESTERN WILLET, *Catoptrophorus semipalmatus inornatus*.—A male was taken along the Cimarron River, seven miles north of Gate, Beaver County, May 16 (Haller). The gonads were not enlarged.

WHITE-RUMPED SANDPIPER, *Pisobia fuscicollis*.—Noted almost daily from May 3 to June 1 at the following points: Indianhoma, Comanche County; Gate, Beaver County; South Canadian River, south of Arnett, Ellis County; salt plains near Edith, Woods County; along the Cimarron River, east of Buffalo, Harper County. A female was taken fifteen miles east of Buffalo, Harper County, May 31 (Sutton).

BAIRD'S SANDPIPER, *Erolia bairdi*.—Noted almost daily from May 3 to June 1 at exactly the same places listed under the White-rumped Sandpiper. A female was collected May 4, three miles south of Indianhoma, Comanche County (Sutton).

DOWITCHER, *Limnodromus griseus*.—This species was noted on three occasions: a single bird, at a cattle-pond two miles northwest of Indianhoma, Comanche County, May 3; two birds (one a female, collected by Sutton), at a shallow lake three miles south of Gate, Beaver County, May 16; and a single female (also collected by Sutton), at a shallow lake south of Gate, May 18. These two female specimens are strikingly dissimilar. The bill of the former measures 73 mm., that of the latter only 60. The chest of the former is heavily marked with roundish spots; that of the latter is almost immaculate. The former is noticeably dark above, the dark bars of the rectrices being much wider than the light ones, whereas in the latter specimen the dark and light bars on the tail are of about equal width. The long-billed bird is clearly *L. g. scolopaceus* (Say), the subspecies listed by Mrs. Nice (ibid., 93) as a "rare transient." The short-billed bird's wing measurement (146 mm.), light appearance, and relatively unspotted chest declare it *L. g. hendersoni* Rowan, the so-called Interior Dowitcher. This name is regarded by some authors, including J. L. Peters ('Check-list of Birds of the World,' 2: 272, 1934) as a synonym of *griseus*. In any event the short-billed bird apparently has not been recorded from Oklahoma.

STILT SANDPIPER, *Micropalama himantopus*.—Noted only in the vicinity of Gate, Beaver County, but common there on May 18 (three specimens taken) and May 25, especially about the shallow lakes near the Beaver River, three miles south of town.

WESTERN SANDPIPER, *Ereunetes maurii*.—A flock of about forty was seen near Indianhoma, Comanche County, May 3. The following day but one was seen in the

same region. One noted May 12 along the Washita River, three miles west of Cheyenne, Roger Mills County. Several noted in the vicinity of Gate, Beaver County, May 16 to 18, and at a small cattle-pond near Arnett, Ellis County, May 27.

AMERICAN AVOCET, *Recurvirostra americana*.—Two observed about lakes three miles south of Gate, Beaver County, May 18. One of these, a male with much enlarged gonads, was collected by Haller.

WILSON'S PHALAROPE, *Steganopus tricolor*.—Mrs. Nice (ibid., 95) considers this an "uncommon transient." We noted it daily while in the Indian Territory (Comanche County), daily while we were at Gate, Beaver County, and last in the vicinity of Arnett, Ellis County, when a male and a female were observed at a small cattle-pond, May 27.

CHIMNEY SWIFT, *Chaetura pelagica*.—Watching carefully for this species on our way eastward across the State, we noted it first at Cherokee, Alfalfa County, then, more commonly, at Pond Creek, Grant County, June 1. Mrs. Nice (ibid., 109) tells us that the species ranges west as far as Oklahoma and Cleveland Counties.

RED-BELLIED WOODPECKER, *Centurus carolinus*.—According to Mrs. Nice (ibid., 112) this species is "resident as far west as Kay, Major, Blaine, Grady and Comanche Counties." We noted it several times in the vicinity of Cheyenne, Roger Mills County, May 10 to 13, collecting a male on the 10th (Haller); at Indian Territory, Comanche County, where a male was taken May 6 (Semple); and in Ellis County, along the north bank of the South Canadian River south of Arnett, May 26. It is our belief that the Red-bellied Woodpecker occurs throughout southwestern Oklahoma wherever there is sufficient tree growth.

DOWNY WOODPECKER, *Dryobates pubescens*.—Some form of Downy Woodpecker nests rather commonly westward to the Texas state-line in Roger Mills and Ellis Counties. In an attempt to determine the identification of these birds a series of six specimens was collected, four of them males. These birds are all much too small for *medianus* (Swainson), the wing of the male averaging 89.5 mm., but are strikingly too white-breasted for *pubescens*. In view of the fact that one female specimen from McCurtain County (GMS 7261), where typical *pubescens* is said to occur, also is very white-breasted, it seems best to refer all Downy Woodpeckers of the southwestern quarter of the State to *pubescens*, at least until it has been determined to what extent soiling is responsible for the dark coloration of *pubescens* from the southeastern United States.

CASSIN'S KINGBIRD, *Tyrannus vociferans*.—This species, which is not listed by Mrs. Nice, we saw repeatedly in the Kenton region May 21 and 22, collecting three females on the latter date; it has, however, been recorded from Oklahoma previously (Sutton, Auk, 53: 431, 1936).

WESTERN ALDER FLYCATCHER, *Empidonax traillii brewsteri*.—Two males taken near Kenton, Cimarron County, respectively on May 20 and 24, have been identified by Mr. Pierce Brodtkorb as *brewsteri*. The gonads were enlarged, but we have no further proof of its breeding. *E. traillii* certainly breeds in the vicinity of Arnett, Ellis County, but we have not yet collected material upon which to base subspecific identification.

EASTERN CROW, *Corvus brachyrhynchos brachyrhynchos*.—The Crow breeds westward to the Texas state-line in parts of Roger Mills and Ellis Counties. Two males were taken; the wing in these measures respectively 325 and 320 mm. A nest containing five small young was found along the Washita River near Cheyenne, Roger Mills County, May 12.

PINYON JAY, *Cyanocephalus cyanocephalus*.—A nest found twelve feet from the ground in a pinyon growing on a mesa top seven miles southeast of Kenton, May 23, held three *quite naked*, dark-colored young. On the preceding day a pair with young just out of the nest was noted in the same region.

TUFTED TITMOUSE, *Baeolophus bicolor*.—This species evidently ranges westward to the Texas state-line at least in the latitude of Cheyenne, Roger Mills County, for we found it fairly common along the Washita River in that region, May 9 to 16.

GRAY TITMOUSE, *Baeolophus inornatus griseus*.—A breeding male was collected seven miles southeast of Kenton, Cimarron County, May 22 (Sutton).

CAROLINA WREN, *Thryothorus ludovicianus ludovicianus*.—Mrs. Nice (ibid., 136) tells us that this species ranges as far west as Kay, Payne, Cleveland, Caddo and Comanche Counties. We found it fairly common in the vicinity of Cheyenne, Roger Mills County, and therefore believe that it occurs as far west as the Texas state-line in that latitude. Several specimens were collected.

ROCK WREN, *Salpinctes obsoletus obsoletus*.—A common bird in the Antelope Hills district of northern Roger Mills County and in the Red Hills north of Gate, Beaver County. At the former place a nest with five somewhat-incubated eggs was found May 11 (Sutton).

CURVE-BILLED THRASHER, *Toxostoma curvirostre curvirostre*.—Recorded several times near Kenton, Cimarron County: a male taken May 21 (Semple); a male taken May 22 (Sutton); a nest with four well-developed young found in a cholla cactus May 23 (Haller). This species is regular, but not common, in the Black Mesa country.

BLUE-GRAY GNATCATCHER, *Poliophtila caerulea caerulea*.—Mrs. Nice (ibid., 145) tells us that this bird summers as far west as Kay, Payne, Canadian, Grady and Comanche Counties. We found it also, and somewhat commonly, in Roger Mills and Ellis Counties, during May.

WHITE-EYED VIREO, *Vireo griseus griseus*.—Noted daily in McCurtain County from April 19 to 24, and also in the Arbuckle Mountain region, though not in the higher parts, from April 28 to May 1.

BELL'S VIREO, *Vireo belli belli*.—Mrs. Nice (ibid., 151) considers this species a "summer resident in northeastern and central Oklahoma." We took a breeding male along the Red River, ten miles southwest of Idabel, McCurtain County, on April 24; found it fairly common locally in the vicinity of Cheyenne, Roger Mills County, May 10; and noted a few pairs along the South Canadian River south of Arnett, Ellis County, collecting a male, May 28 (Sutton).

GRAY VIREO, *Vireo vicinior*.—Finding a nesting pair of these birds in a little canyon among the mesas eight miles southeast of Kenton was a great surprise. When first encountered, the male was singing while the female was gathering nesting material. The male was collected May 22 (Sutton). This species has not heretofore been recorded in the State.

BLUE-HEADED VIREO, *Vireo solitarius solitarius*.—A female *solitarius* taken by Sutton two miles south of Indianahoma, Comanche County, May 8, proves to be of the eastern race, the wing measuring 73 mm., the tail 54; the general coloration is too bright for *cassini* Xantus. According to Mrs. Nice (ibid., 153) this bird has not heretofore actually been collected in the State.

RED-EYED VIREO, *Vireo olivaceus*.—Mrs. Nice (ibid., 153) tells us that this species nests as far west as Kay, Caddo, and Comanche Counties. We found it also in Roger Mills County, and collected a breeding male near Cheyenne May 14 (Haller).

WORM-EATING WARBLER, *Helminthos vermivorus*.—Mrs. Nice (ibid., 155) calls this species a "rare transient in eastern Oklahoma," stating that there is no record of a specimen taken in the State. We found at least one nesting pair in rather open woodland seven miles south of Jay, Delaware County, and collected a male June 11 (Haller). The common tree in this district was a species of oak, and the characteristic birds were the Yellow-breasted Chat, Wood Pewee, Chipping Sparrow, Blue-gray Gnatcatcher, Summer and Scarlet Tanagers.

NASHVILLE WARBLER, *Vermivora ruficapilla ruficapilla*.—Mrs. Nice (ibid., 156) is correct in calling this species an "uncommon" transient. We did, however, record it almost every day from April 19 to the end of the month in McCurtain and Murray Counties; from May 6 to 8 in Comanche County; and once (May 14) near Cheyenne, Roger Mills County. Three males were taken.

BLACK-THROATED GREEN WARBLER, *Dendroica virens virens*.—Noted twice: April 19, a male seen along the Mountain Fork River, seven miles east of Broken Bow; and April 23, a male collected in the Kiamichi Mountains, eight miles east of Bethel (Sutton). According to Mrs. Nice (ibid., 160) this well-known species has not heretofore been collected in the State.

SYCAMORE WARBLER, *Dendroica dominica albilora*.—A series of six males taken in McCurtain, Washington and Delaware Counties, is uniform in being big-billed. One specimen (KWH 442) has a hint of yellow in the forepart of the superciliary line, however. Washington County is not listed among the counties in which this species is known to summer (Nice, ibid., 159).

CHESTNUT-SIDED WARBLER, *Dendroica pensylvanica*.—A female taken by Haller on a mesa top near Kenton, Cimarron County, May 21, is apparently the first specimen of this species for the State. Mrs. Nice does not mention it in her list.

OVEN-BIRD, *Seiurus aurocapillus*.—Noted in two localities: in northern McCurtain County, where three birds were seen and a breeding female collected, April 23 (Sutton); and in Delaware County, where several pairs were noted and a breeding male was taken June 12, eight miles southeast of Jay (Sutton).

GRINNELL'S WATER-THRUSH, *Seiurus noveboracensis notabilis*.—A male taken two miles north of Cheyenne, Roger Mills County, May 15 (Sutton), is characteristically big-billed, the culmen measuring 13.5 mm.

CONNECTICUT WARBLER, *Oporornis agilis*.—A male taken along Horse Creek, two miles north of Gate, Beaver County, May 18 (Sutton), is apparently the first specimen of this species for the State. Mrs. Nice does not mention it in her list.

MACGILLIVRAY'S WARBLER, *Oporornis tolmiei*.—Recorded at Cheyenne, Roger Mills County, on May 13 and 15; again, May 20, when a male and a female were collected near Kenton, Cimarron County (Sutton); again, May 24, when a female was taken on the Brookhart Ranch, seventeen miles northeast of Kenton (Semple).

YELLOW-HEADED BLACKBIRD, *Xanthocephalus xanthocephalus*.—Noted irregularly between May 2 and 18 at various points. A few breeding pairs were observed with Red-wings at a marsh along the main highway, three miles southwest of Optima, Texas County, May 25.

SCARLET TANAGER, *Piranga erythromelas*.—To the counties in which this species is known to breed (Nice, ibid., 172) we wish to add Delaware. In the oak woods south of Jay we found it fairly common, June 11 and 12.

BLACK-HEADED GROSEBEAK, *Hedymeles melanocephalus melanocephalus*.—Recorded three times: a male, five miles southwest of Cheyenne, Roger Mills County, May 10;

a male, four miles west of Cheyenne, May 13; and a male (gonads somewhat enlarged) taken near Kenton, Cimarron County, May 24 (Sutton). The measurements of this specimen are: wing, 98 mm., tail, 79, and culmen, 17.5.

BLUE GROBBEAK, *Guiraca caerulea*.—Noted repeatedly in the following counties: McCurtain, Murray, Comanche, Roger Mills, Ellis, Cimarron, Noble, Logan, Payne and Delaware; several specimens were collected.

INDIGO BUNTING, *Passerina cyanea*.—Ranges westward to the Texas state-line in Roger Mills and Ellis Counties, being locally common near Cheyenne, and fairly common along the South Canadian River south of Arnett.

LAZULI BUNTING, *Passerina amoena*.—Mrs. Nice (ibid., 175) calls this species a "rare summer resident in Cimarron County." We found it common along the Washita River near Cheyenne, Roger Mills County, and along a stretch of the north bank of the South Canadian River, in southern Ellis County. In the former locality *P. cyanea*, *P. amoena*, and *P. ciris* nested side by side. A breeding pair of *amoena* taken in southern Ellis County, May 26, had a nest with two eggs (Sutton).

PAINTED BUNTING, *Passerina ciris ciris*.—We found this species breeding abundantly in the vicinity of Cheyenne, Roger Mills County; somewhat commonly on the South Canadian River along the southern border of Ellis County; sparingly in the 'red' hills, seventeen miles south of Freedom, in Woodward County. The several specimens taken are somewhat large for the eastern race, but the blue of the head in the male is too purple for *P. c. pallidior* Mearns.

GOLDFINCH, *Spinus tristis*.—Noted here and there throughout the State, but no nests found. The only specimen collected, a very bright male taken near Kenton, Cimarron County, May 20 (Sutton), is referable to the subspecies *pallidus* Mearns, a race not heretofore recorded from the State. The wing of this specimen measures 76 mm., the tail 49.

LARK BUNTING, *Calamospiza melanocorys*.—Noted almost daily from May 10 to 25. Breeding birds were collected near Cheyenne and about the Antelope Hills, in Roger Mills County; and an astonishingly large and compact colony was found May 19 in treeless country seventeen miles southeast of Kenton, in Cimarron County. Apparently this species is irregularly and locally abundant as a nesting bird in western Oklahoma.

WESTERN GRASSHOPPER SPARROW, *Ammodramus savannarum perpallidus*.—The Grasshopper Sparrow was recorded at every point visited save Kenton, Cimarron County; seven specimens were collected. Measurements indicate that all these birds are too large for the eastern race, the wings of the five males ranging from 61 to 64 mm., and averaging 61.8; the tails ranging from 46 to 49, averaging 47.4.

LECONTE'S SPARROW, *Passerherbulus caudacutus*.—A molting male was taken at edge of a grassy field three miles south of Eagletown, McCurtain County, April 20 (Semple).

ROCK SPARROW, *Aimophila ruficeps eremoeca*.—Noted in the Arbuckle Mountains, Murray County; the Washitas in Comanche County; the Black Mesa country of Cimarron County; and the red-colored hills seventeen miles south of Freedom, in Woodward County. Not noted, strangely enough, in the Antelope Hills of northern Roger Mills County, nor in the Red Hills along the Cimarron River north of Gate, Beaver County.

OAK-WOODS SPARROW, *Aimophila aestivalis illinoensis*.—On April 23, Semple and Sutton discovered a breeding colony of these sparrows in northern McCurtain County,

about a mile and a quarter east of Bethel. They succeeded in collecting four specimens, three males and a female that was laying eggs. In all four of these specimens the brown of the upper parts is much too yellow in tone for *A. a. aestivalis*, or for *A. a. bachmani*, and while we have not seen Ridgway's type of *Peucaea illinoensis*, his definition of that bird appears to fit the present series perfectly.

Mrs. Nice (ibid., 185) lists the Bachman's Sparrow, naming a single specimen taken at Alva, Woods County. We have not seen this specimen but suspect that it may be similar to our four birds from McCurtain County.

DESERT SPARROW, *Amphispiza bilineata deserticola*.—A breeding pair was collected along the Tesquesquite (Texakeet), near Kenton, Cimarron County, May 27 (Sutton).

WESTERN FIELD SPARROW, *Spizella pusilla arenacea*.—The Field Sparrow nests westward to the Texas state-line in Roger Mills and Ellis Counties. We did not encounter it at Gate, Beaver County, nor anywhere in the Panhandle. Mrs. Nice (ibid., 189) tells us that eastern *S. p. pusilla* (Wilson) is a "summer resident in eastern and central Oklahoma," but the wing and tail measurements of specimens taken by us in Logan and McCurtain Counties are noticeably larger than those given by Ridgway for *pusilla*; and several breeding specimens collected by us in Ellis, Murray and Roger Mills Counties are so very large that we are forced to the conclusion that *arenacea* is the breeding race of this region. The tail (in four breeding males taken by us in Roger Mills and Ellis Counties) ranges from 67 to 73 mm., averaging 69.6. The extremes given by Ridgway for the tail of *arenacea* are 66 and 71.8, with the average at 68.8 ('Birds of North and Middle America,' 1: 320, 1901).

GAMBEL'S SPARROW, *Zonotrichia leucophrys gambeli*.—Recorded several times in Comanche and Roger Mills Counties. A female was taken near Indianoma, May 8; another female, near Cheyenne, May 13.

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TWO NEW BIRDS FROM THE KINGDOM OF SIAM

BY H. G. DEIGNAN

CONTINUED study of the collection of birds recently made in Siam by the writer for the United States National Museum, has revealed the existence in the national collection of specimens of two more Indo-Chinese forms which demand subspecific recognition. I am indebted to Dr. Ernst Mayr of the American Museum of Natural History, who has lent me valuable comparative material of the species concerned, and to Mr. J. H. Riley, of the U. S. National Museum, who has granted me the privilege of naming them.

The first, a minivet, may be known as:

***Pericrocotus solaris nassovicus* subsp. nov.**

Type.—Adult male, United States National Museum no. 324499; collected on Khao Khuap, Krat (Trat) Province, southeastern Siam, December 24, 1929, by Dr. Hugh M. Smith.

Diagnosis.—Male: general color a vivid grenadine-red (Ridgway) as in *Pericrocotus solaris cinereigula* of North Borneo, not vivid orange-chrome (Ridgway) as in *P. s. solaris* of the Himalayas and *P. s. griseigularis* of Taiwan. The gray of the throat is intermediate in hue between that of *cinereigula* and *solaris*, and faintly washed with dull orange in the center. The ear coverts are gray and sharply demarcated from the slaty-black crown, as in *solaris*. The upper parts are (excepting the grenadine-red lower back and rump) slaty black, as in both *solaris* and *cinereigula*.

Female: under parts pure yellow as in *cinereigula*, lacking the greenish tinge of *solaris*. The throat and ear coverts are as in the corresponding sex of both *solaris* and *cinereigula*. The gray upper parts are as in *cinereigula*, but with a barely discernible greenish wash just before meeting the greenish yellow of the lower back (in *solaris* the whole of the upper back is more or less strongly washed with olive green).

Measurements: as in the related races.

Distribution.—Probably confined to the Chain of the Elephant, an isolated mountain range of western Cambodia and southeastern Siam.

Material examined.—*P. s. solaris*: 38 (Sikkim, 5; northern Cachar, 2; northern Siam, 31). *P. s. griseigularis*: 17 (Taiwan, 11; Fukien, 4; Kwangtung, 1; "E. China," 1). *P. s. tripponi*: 1 (Siam-Kengtung boundary, 1). *P. s. nassovicus*: 2 (southeastern Siam, 2). *P. s. montanus*: 4 (Selangor-Pahang boundary, 4). *P. s. cinereigula*: 4 (British North Borneo, 4).

Remarks.—It has been customary to recognize two closely related species in this section of the genus *Pericrocotus*: *solaris*, with a number of subspecies, occurring from the eastern Himalayas to the island of Taiwan, south to Tenasserim, northern Siam, and southern Annam; and *montanus*, with two subspecies, occurring in Sumatra, the southern third of the Malay Peninsula, and in Borneo. As the new subspecies might with equal reason be considered a race of either *solaris* or *montanus*, there is no alternative but to consider all of the forms races of a single species, under the name *solaris*.

In consideration of the provenance of *nassovicus*, one might expect it to be more nearly related to the form *montanus*, of Malaya, than to the geographically more remote *cinereigula* of Borneo, but in the series available to me, such is apparently not the case. At most, however, the two Malaysian races are but slightly differentiated from each other. I am unable to distinguish between Formosan specimens and those from the Chinese mainland (for which the name *mandarinus* has been proposed) and accordingly call all East Chinese birds *griseigularis*.

The new form is named in honor of Princeton University, in allusion to the bird's orange and black plumage.

The second new form, a flycatcher-warbler, may be called:

***Abroscopus albogularis hugonis* subsp. nov.**

Type.—Adult male, United States National Museum no. 330869; collected at Pang Me Ton, northern Siam, May 2, 1931, by Dr. Hugh M. Smith.

Diagnosis.—Crown pale rufous brown without olive wash, as in *Abroscopus albogularis albogularis* of the Himalayas; sides of head pale chestnut, rather less vivid than in *albogularis*; upper parts dark olive green, exactly as in *Abroscopus albogularis fulvifacies* of China, not bright golden olive as in the typical race; below, with a broad and distinct bright-yellow breast-band, as in *albogularis*.

Measurements: as in the related forms.

Distribution.—The only specimens known of this apparently rare bird come from the complex of high mountains on the Chiangmai-Chiangrai provincial boundary, northern Siam (south of Wieng Pa Pao). The author has, however, twice seen it alive, once on Doi Angka, and once on Doi Sutep, each time in the evergreen forest-belt at about 4500 feet.

Specimens examined.—*A. a. albogularis*: 5 (eastern Himalayas, 1; Upper Assam, 4). *A. a. hugonis*: 2 (northern Siam, 2). *A. a. fulvifacies*: 10 (Szechuan, 2; Fukien, 4; Taiwan, 4).

The new subspecies is named in honor of its discoverer, Dr. Hugh McCormick Smith, of Washington, *olim* of the Royal Siamese Department of Fisheries.

United States National Museum
Washington, D. C.

WEIGHTS AND WING AREAS IN NORTH AMERICAN BIRDS

BY EARL L. POOLE

SEVERAL years ago the writer started to collect data on the relationship between weight and wing area of such species of our native birds as came into his hands. While considerable data on this subject have been collected in Europe, North Africa, and the Malay States, the aim has been in most cases to relate these data to aviation. The method employed has been to compute the entire 'bearing' area of the bird, as its shadow would be cast under a vertical ray of light, wings, tail, and body alike, being considered. On the other hand, my idea was chiefly to note the relationship of the factors of weight and wing area in different groups of birds, the variations within the species, the adjustability of the ratio to different types of flight in such species as habitually vary their method of flight, and to note what effect, if any, the ratio has on the flight characteristics of such species. By measuring only the area of the wing stretched to its full extent it seemed that any relative difference would be expressed more definitely than by considering the entire supporting area, body, tail and wings together. In other words, since the more usual method of flight among birds is by means of flapping, in which the motions of the wings form the supporting and propelling mechanism, it has seemed more logical to consider the wing areas only, rather than include the entire supporting area which functions in soaring flight. I have therefore included in the accompanying table, first, the weight of the bird in grams, taken as soon after death as possible; second, the area of both wings, fully outstretched, in square centimeters, which were closely traced for this purpose, and the resultant outlines measured accurately with a polar planimeter; finally, the ratio obtained by dividing the weight in grams into the area of both wings, as previously determined.

After weighing and measuring some hundreds of such species as came into my hands during the past few years, and arranging the results in a graph, it became evident that some rather interesting and unexpected conclusions could be drawn.

That there is a normal diminution in relative wing area with the heavier species, will be readily seen. It seems almost incredible that a Loon should have a wing ratio of only 0.56 square centimeters per gram weight, while a Black-chinned Hummingbird shows a ratio of 5.0 square centimeters per gram, almost ten times that of the Loon, and the Golden-crowned Kinglet has a ratio of 8.87 square centimeters per gram, well over fifteen times that of the Loon.

One possible explanation for this disparity in ratio may be that there is a constant ineffective marginal area, which may be actually or nearly the

same in both the large and the small species. Such an area would be ineffective through the tendency of the air, a flexible and compressible medium, to 'slip' around the margin of the wing rather than present a fairly secure purchase. As an illustration, a marginal area of slightly less than 7 millimeters in width, subtracted from the hummingbird's wing would reduce its wing ratio from 5.0 to 0.48, while a margin of the same width subtracted from the wings of the Loon would only reduce its ratio from 0.56 to 0.49, a negligible reduction. It is conceivable that such a factor would actually be somewhat variable, depending upon the rapidity of wing-beats, and possibly other considerations. Normally we would assume that a bird of soaring flight, such as the Turkey Vulture, or the Golden Eagle, would carry relatively more sail than a bird of rapid and direct flight, such as the Whistling Swan. As a matter of fact, the Golden Eagle has almost exactly twice the wing area of the Swan, the Red-tailed Hawk has more than twice the wing area of the Mallard and Ring-necked Pheasant, while the Turkey Vulture possesses well over three times the area of the Loon.

Generally speaking, among the larger birds, the owls and the herons possess the highest ratios, with the soaring hawks and the vulture close seconds. There is a decided gap between the latter and the rails. Then follow the freshwater ducks and geese, the gallinaceous birds, and finally the loons, grebes, and bay ducks. Among the smaller birds the comparative ratios are much closer, making it impossible to draw any deductions, except in the case of the Bob-white, which falls far below the others of comparable weight. As a rule the stronger fliers, such as the swallows and the Chimney Swift and Nighthawk, are very high, while the Leach's Petrel is apparently in a class by itself, with twice the ratio of most birds of its size. The ground-feeding birds, especially those species which ordinarily fly comparatively little—the Song Sparrow, Hermit Thrush, and Towhee—are all very low in ratio.

A rather notable exception to the rule that the birds of strong and protracted flight possess greater alar ratios is seen in the case of the humming-birds, but their comparatively small wings are offset by the phenomenal speed with which they are used. I have recently seen a statement to the effect that the Rubythroat is capable of 75 wing-beats to the second (O. S. Pettingill, Jr., *Bird-Lore*, vol. 39, p. 194).

It is well known that many birds are capable of varying their manner of flight to a considerable extent by adjusting the area to meet the air conditions. I have frequently noticed the adaptability of hawks in this respect, while they were migrating along the Kittatinny Ridge. On days of low wind velocity, the wings are usually extended to obtain the maximum bearing area, while on days of comparatively high wind velocity they are

flexed to a great degree. This reduction in wing ratio at such times may amount to 33 per cent of the maximum. There is also a considerable variation in ratio within each species; the Red-tailed Hawks have ranged from 1.63 to 2.73, the latter having been a rather emaciated male, while the former was a very fat female, but in the main there is a rather close conformity to the median.

Some closely related species show a wide disparity in wing ratio. It is interesting to note that the ratio of the Fish Crow (*Corvus ossifragus*) is 3.325, while that of the Eastern Crow (*Corvus b. brachyrhynchos*) is 2.43. This difference appears to be reflected in the flight of the two species; that of the former is ordinarily lighter and more buoyant than that of the latter.

It may be said, in general, that the ratio is reflected in the manner of flight of the species, as the large-winged herons and owls possess a peculiarly slow heavy flight, contrasting with the exceedingly rapid wing beats of the bay ducks, grebes, and loons, and inversely related to the speed at which the bird ordinarily flies. Such apparent exceptions as the case of the Chimney Swift, which is comparatively high in its weight group, may be due to the fact that the swift, like the swallows, is more completely aerial in its adaptation, spends long periods of time in the air, and has developed a method of flight that attains great speed at a minimum expenditure of effort.

The appended table, listing the weight in grams, area of both wings in square centimeters, and ratio of the two as obtained by dividing the former into the latter, is far from complete, but covers 143 North American species, arranged in order of their weight, from the Black-chinned Hummingbird, weighing 2.55 grams, to the Mute Swan, weighing 11,602 grams. In certain cases, as in the hawks and owls, where there is a considerable disparity in the weight of males and females, I have arranged the sexes separately in the table, according to their weight. In other cases where more than one specimen of a species was measured, I have taken an average for that species.

As might be expected, according to the law which appears to govern the reduction in wing ratio with the increase in weight, the heavier sex in each case, whether male or female, shows a lower ratio than the lighter one, demonstrating that this law functions within the species as well as among different species. Two female Mallards, for instance, with an average weight of 1233.5 grams show an average ratio of 0.769, while with two males of an average weight of 1408 grams, the ratio is but 0.73. A male Duck Hawk weighing 712 grams had a ratio of 1.61, while a female of the same species, weighing 1222.5 grams had a lower ratio of 1.10; and two male Screech Owls, with an average weight of 178 grams show a ratio of 2.94, while in two females with an average weight of 254 grams the ratio is reduced to

1.87. In such species as the Goshawk and Long-eared Owl, the same reduction is to be noted in the ratio of the heavier sex.

Weights and Wing-area Ratios (of 143 Species of North American Birds)

	Weight grams	Wing area sq. cm.	Wing area per gram
Black-chinned Hummingbird, <i>Archilochus alexandri</i> , male	2.55	12.75	5.00
Ruby-throated Hummingbird, <i>Archilochus colubris</i> , male	2.98	12.40	4.16
Eastern Golden-crowned Kinglet, <i>Regulus s. satrapa</i>	5.75	51.	8.87
Eastern Ruby-crowned Kinglet, <i>Corthylio c. calendula</i> (av. 2)	6.73	58.25	8.66
American Redstart, <i>Setophaga ruticilla</i>	8.	62.5	7.61
Brown Creeper, <i>Certhia familiaris americana</i> (av. 2)	8.	66.5	8.31
Magnolia Warbler, <i>Dendroica magnolia</i>	9.20	69.	7.50
Black-throated Green Warbler, <i>Dendroica v. virens</i>	9.20	58.50	6.36
Black-throated Blue Warbler, <i>Dendroica c. caerulescens</i>	9.25	67.	7.34
Eastern Winter Wren, <i>Nannus h. hiemalis</i>	9.4	41.	4.36
Northern Yellow-throat, <i>Geothlypis trichas brachidactyla</i>	9.5	58.53	6.26
Black and White Warbler, <i>Mniotilta varia</i>	10.5	71.	6.19
Eastern House Wren, <i>Troglodytes a. addon</i>	11.	48.40	4.40
Chestnut-sided Warbler, <i>Dendroica pensylvanica</i> . .	11.1	60.5	5.45
Northern Parula Warbler, <i>Compsothlypis americana pusilla</i>	11.85	56.	4.73
Eastern Field Sparrow, <i>Spizella p. pusilla</i>	12.1	62.	5.12
Black-capped Chickadee, <i>Penthestes a. atricapillus</i> .	12.5	76.	6.08
Indigo Bunting, <i>Passerina cyanea</i>	13.	82.	6.31
Eastern Chipping Sparrow, <i>Spizella p. passerina</i> . .	13.5	91.	6.74
Eastern Goldfinch, <i>Spinus t. tristis</i> (av. 2)	14.	83.	5.92
Northern Water-Thrush, <i>Seiurus n. noveboracensis</i> .	14.5	86.	5.93
Myrtle Warbler, <i>Dendroica coronata</i>	15.5	91.	5.87
Rough-winged Swallow, <i>Stelgidopteryx ruficollis serripennis</i> (av. 2)	15.75	107.	6.79
Blue-headed Vireo, <i>Vireo s. solitarius</i>	16.75	88.	5.25
Barn Swallow, <i>Hirundo erythrogaster</i> (av. 2)	17.	118.5	6.96
Swamp Sparrow, <i>Melospiza georgiana</i> (av. 3)	17.	73.	4.30
Chimney Swift, <i>Chaetura pelagica</i>	17.3	104.	6.00
Lincoln's Sparrow, <i>Melospiza l. lincolni</i>	17.8	72.5	4.07
Eastern Tree Sparrow, <i>Spizella a. arborea</i> (av. 2) . .	18.	90.	4.99
Eastern Grasshopper Sparrow, <i>Ammodramus savannarum australis</i>	18.5	89.	5.23
American Pipit, <i>Anthus spinoletta rubescens</i> , female	19.	109.	5.74
Phoebe, <i>Sayornis phoebe</i> , female (av. 2)	20.	134.5	6.73
Tree Swallow, <i>Iridoprocne bicolor</i> , male	20.1	125.	6.22
Slate-colored Junco, <i>Junco h. hyemalis</i> (av. 2)	21.5	99.	4.42

	Weight grams	Wing area sq. cm.	Wing area per gram
Eastern Song Sparrow, <i>Melospiza m. melodia</i> (av. 2).....	22.	86.5	3.94
Tufted Titmouse, <i>Baeolophus bicolor</i> (av. 2).....	22.5	117.8	5.21
Orchard Oriole, <i>Icterus spurius</i>	23.	100.5	4.37
English Sparrow, <i>Passer d. domesticus</i> (av. 2).....	24.5	92.5	3.78
Eastern Purple Finch, <i>Carpodacus p. purpureus</i> ...	24.5	104.	4.24
Downy Woodpecker, <i>Dryobates pubescens medianus</i> (av. 3).....	24.8	136.	5.54
Cedar Waxwing, <i>Bombycilla cedrorum</i>	25.	130.	5.65
Leach's Petrel, <i>Oceanodroma l. leucorhoa</i>	26.5	251.	9.47
White-throated Sparrow, <i>Zonotrichia albicollis</i> ...	26.5	108.	4.07
Eastern Vesper Sparrow, <i>Poocetes g. gramineus</i> ...	27.	108.	4.00
Eastern Hermit Thrush, <i>Hylocichla guttata faxonii</i> .	29.5	116.	3.89
Veery, <i>Hylocichla f. fuscescens</i> (av. 2).....	32.3	147.	4.59
Eastern Bluebird, <i>Sialia s. sialis</i>	32.7	148.	4.53
Gray-cheeked Thrush, <i>Hylocichla minima aliciae</i> ..	34.	150.	4.41
Hepatic Tanager, <i>Piranga flava hepatica</i>	35.8	153.	4.26
Catbird, <i>Dumetella carolinensis</i>	39.	150.	3.84
Rose-breasted Grosbeak, <i>Hedymeles ludovicianus</i> , male.....	40.	166.5	4.16
Eastern Fox Sparrow, <i>Passerella i. iliaca</i>	40.5	116.	2.85
Red-eyed Towhee, <i>Pipilo e. erythrophthalmus</i> (av. 2).....	41.7	145.	3.49
Purple Martin, <i>Progne s. subis</i> (av. 2).....	43.	185.5	4.32
Black-headed Grosbeak, <i>Hedymeles m. melanocephalus</i>	44.7	200.	4.47
Eastern Solitary Sandpiper, <i>Tringa s. solitaria</i> ...	47.	192.	4.08
Spotted Sandpiper, <i>Actitis macularia</i>	47.5	146.	3.07
Canadian Pine Grosbeak, <i>Pinicola enucleator</i> <i>leucura</i>	50.	189.	3.78
Eastern Cowbird, <i>Molothrus a. ater</i>	50.5	179.	3.54
Yellow-billed Cuckoo, <i>Coccyzus a. americanus</i>	61.	266.	4.36
Virginia Rail, <i>Rallus l. limicola</i>	65.	221.	3.40
Eastern Red-wing, <i>Agelaius p. phoeniceus</i>	70.	245.	3.50
Ant-eating Woodpecker, <i>Balanosphyra f. formicivora</i>	74.5	306.	4.11
Sora, <i>Porzana carolina</i>	75.	176.	2.34
Eastern Nighthawk, <i>Chordeiles m. minor</i> (av. 2)...	75.25	349.5	4.64
Eastern Robin, <i>Turdus m. migratorius</i>	82.	244.	2.97
Starling, <i>Sturnus v. vulgaris</i> (av. 3).....	84.	190.3	2.25
Killdeer, <i>Oxyechus v. vociferus</i>	85.	275.	3.23
Red-bellied Woodpecker, <i>Centurus carolinus</i>	87.	262.	3.00
Northern Blue Jay, <i>Cyanocitta c. cristata</i>	89.	236.	2.65
Dovekie, <i>Alle alle</i>	96.	146.	1.52
Sharp-shinned Hawk, <i>Accipiter v. velox</i> , male (av. 2)	97.5	439.	4.50
Northern Flicker, <i>Colaptes auratus luteus</i> , male...	100.	324.	3.24
Pectoral Sandpiper, <i>Pisobia melanotos</i>	101.	199.	1.97

	Weight	Wing area	Wing area
	grams	sq. cm.	per gram
Pinyon Jay, <i>Cyanocephalus cyanocephalus</i>	108.	390.	3.70
✓ Saw-whet Owl, <i>Cryptoglaux a. acadica</i>	108.	420.	3.88
Wilson's Snipe, <i>Capella delicata</i>	112.	250.	2.22
Purple Grackle, <i>Quiscalus q. quiscula</i> (av. 3)	122.3	324.	2.65
Eastern Mourning Dove, <i>Zenaidura macroura carolinensis</i> (av. 2)	130.	357.5	2.36
Eastern Sparrow Hawk, <i>Falco s. sparverius</i> , female (av. 2)	137.	372.	2.74
Eastern Meadowlark, <i>Sturnella m. magna</i>	145.	265.	1.83
Eastern Belted Kingfisher, <i>Megasceryle a. alcyon</i> , male (av. 2)	155.	376.	2.45
Greater Yellow-legs, <i>Totanus melanoleucus</i> , male	170.	412.	2.42
Sharp-shinned Hawk, <i>Accipiter v. velox</i> , female	171.	607.	3.55
Eastern Pigeon Hawk, <i>Falco c. columbarius</i> , male	173.	410.	2.37
Eastern Screech Owl, <i>Otus asio naevius</i> , male (av. 2)	178.	523.	2.94
American Woodcock, <i>Philohela minor</i> (av. 3)	198.5	354.66	1.65
Eastern Bob-white, <i>Colinus v. virginianus</i> (av. 5)	198.64	216.8	1.09
King Rail, <i>Rallus e. elegans</i>	227.	536.	2.36
Eastern Green Heron, <i>Butorides v. virescens</i>	230.	660.	2.87
Long-eared Owl, <i>Asio wilsonianus</i> , male	230.	1182.	5.13
Screech Owl, <i>Otus asio naevius</i> , female	254.	476.	1.87
Fish Crow, <i>Corvus ossifragus</i> , female (av. 2)	273.5	912.5	3.325
Long-eared Owl, <i>Asio wilsonianus</i> , female (av. 2)	288.	1198.	4.22
Fish Crow, <i>Corvus ossifragus</i> , male	309.	1072.	3.46
Rock Dove (Domestic Pigeon), <i>Columba l. livia</i> (av. 2)	314.	567.	1.66
Green-winged Teal, <i>Nettion carolinense</i> , female	321.	374.	1.16
Blue-winged Teal, <i>Querquedula discors</i>	332.	370.	1.10
Florida Gallinule, <i>Gallinula chloropus cachinnans</i> (av. 2)	332.	479.5	1.45
Pied-billed Grebe, <i>Podilymbus p. podiceps</i> (av. 2)	343.5	291.	.81
Horned Grebe, <i>Colymbus auritus</i> (av. 2)	369.5	350.	.95
Broad-winged Hawk, <i>Buteo p. platypterus</i>	376.	1012.	2.69
Buffle-head, <i>Charitonetta albeola</i> , male (imm.)	377.	412.	1.09
Marsh Hawk, <i>Circus hudsonius</i> , male	414.	1382.	3.34
Cooper's Hawk, <i>Accipiter cooperi</i> (av. 2)	428.5	898.	2.07
American Coot, <i>Fulica a. americana</i>	435.	596.	1.37
Little Blue Heron, <i>Florida c. caerulea</i> (av. 2, imm.)	449.	1246.5	2.77
Barn Owl, <i>Tyto alba pratincola</i> (av. 2)	505.	1683.	3.37
Northern Barred Owl, <i>Strix v. varia</i>	510.	1830.	3.59
Eastern Ruffed Grouse, <i>Bonasa u. umbellus</i>	516.5	527.	1.02
Eastern Crow, <i>Corvus b. brachyrhynchos</i> (av. 2)	552.5	1344.	2.43
Shoveller, <i>Spatula clypeata</i> (av. 2)	570.	570.	1.00
Wood Duck, <i>Aix sponsa</i> , male	589.	660.	1.12
Marsh Hawk, <i>Circus hudsonius</i> , female	615.	1696.	2.75
American Bittern, <i>Botaurus lentiginosus</i> , female	625.	1258.	2.01
Ruddy Duck, <i>Erimatura jamaicensis rubida</i>	635.	394.	.62

	Weight grams	Wing area sq. cm.	Wing area per gram
Duck Hawk, <i>Falco peregrinus anatum</i> , male.....	712.	1146.	1.61
Gadwall, <i>Chadefasmus streperus</i>	723.	718.	.993
Ring-necked Duck, <i>Nyroca collaris</i> (av. 3).....	757.31	460.	.61
Lesser Scaup Duck, <i>Nyroca affinis</i> , female.....	763.	472.	.62
Black-crowned Night Heron, <i>Nycticorax nycticorax</i> <i>hoactli</i> (av. 3).....	804.	1773.	2.21
Northern Red-shouldered Hawk, <i>Buteo l. lineatus</i> (av. 3).....	804.	1656.	2.11
Eastern Goshawk, <i>Astur a. atricapillus</i> , male.....	848.6	1480.	1.74
Herring Gull, <i>Larus argentatus smithsonianus</i>	850.	2006.	2.40
Eastern Red-tailed Hawk, <i>Buteo b. borealis</i> , male..	875.	1878.	2.14
American Egret, <i>Casmerodius albus egretta</i>	899.	2528.	2.81
American Pintail, <i>Dafila acuta tzitzihua</i> (av. 2)....	970.	761.	.784
American Brant, <i>Branta bernicla hrota</i> , female.....	1024.	1264.	1.23
Old-squaw, <i>Clangula hyemalis</i> , male.....	1038.	550.48	.53
American Rough-legged Hawk, <i>Buteo lagopus s.</i> <i>johannis</i>	1110.	2592.	2.33
Common Black Duck, <i>Anas rubripes tristis</i> , female	1142.	1007.	.882
Duck Hawk, <i>Falco peregrinus anatum</i> , female.....	1222.5	1342.	1.10
Common Mallard, <i>Anas p. platyrhynchos</i> , female (av. 2).....	1233.5	952.	.769
Ring-necked Pheasant, <i>Phasianus colchicus torquatus</i> (av. 3).....	1304.	917.	.701
Eastern Red-tailed Hawk, <i>Buteo b. borealis</i> , female (av. 2).....	1307.	2294.	1.75
Eastern Goshawk, <i>Astur a. atricapillus</i> , female....	1370.	2004.	1.45
Snowy Owl, <i>Nyctea nyctea</i> , male.....	1404.	2576.	1.835
Common Mallard, <i>Anas p. platyrhynchos</i> , male (av. 2).....	1408.	1029.	.73
Great Horned Owl, <i>Bubo v. virginianus</i> , female (av. 2).....	1446.5	2534.	1.765
Pacific Horned Owl, <i>Bubo virginianus pacificus</i>	1480.	2426.	1.64
Osprey, <i>Pandion haliaetus carolinensis</i> (av. 2).....	1797.5	3211.	1.79
Great Blue Heron, <i>Ardea h. herodias</i>	1905.	4436.	2.33
Turkey Vulture, <i>Cathartes aura septentrionalis</i>	2409.	4356.	1.81
Common Loon, <i>Gavia i. immer</i> , female.....	2425.	1358.	.56
Eastern Turkey, <i>Meleagris gallopavo silvestris</i> (small) female.....	3897.	3752.	.962
Golden Eagle, <i>Aquila chrysaetos canadensis</i> , female	4664.	6520.	1.397
Common Canada Goose, <i>Branta c. canadensis</i> (fat)	5662.	2820.	.498
Whistling Swan, <i>Cygnus columbianus</i>	5943.	4156.	.699
Mute Swan, <i>Sthenelides olor</i> , female.....	11,602.	6808.	.59

Reading Public Museum and Art Gallery
Reading, Pennsylvania

GENERAL NOTES

American Egret in the Hudson River Valley.—Dr. Stoner (Auk, 55: 119-121, 1938) has made detailed report upon the status of the American Egret (*Casmerodius albus egretta*) along the upper Hudson River during the summer of 1937. For comparative purposes, it is now interesting to record some observations, previously unpublished, made during 1934 by Dr. W. C. Muenscher and the writer, while investigating, for the Biological Survey of the New York State Department of Conservation, the aquatic vegetation in the Mohawk and Hudson River Valleys. American Egrets were observed during that season on August 27, five on tidal mud flat and sand bar in Hudson River between Hudson and Athens; August 28, twelve along Hudson River just north of Newton Hook; August 29, one on mud flat at Hudson; and August 30, one at mouth of Stockport Creek. During the period in the field, we visited many lakes and ponds on both sides of the river, and worked up and down the Mohawk Valley, concentrating particularly on the section of river between Schenectady and Troy, but saw no egrets except as indicated along the Hudson River, although Great Blue and Green Herons were common and generally distributed throughout the area surveyed.—ROBERT T. CLAUSEN, *Bailey Hortorium, Cornell University, Ithaca, New York.*

American Egret in Saskatchewan.—On August 7, 1937, a banded American Egret (*Casmerodius albus egretta*) was collected by Mr. R. Lloyd, of Davidson, Saskatchewan, in a colony of Great Blue Herons and Black-crowned Night Herons near Davidson. The specimen is now in the Provincial Museum, Normal School, at Regina, and, according to Mr. F. A. Dunk, Director of the Museum, it is the first record of the American Egret for that province. This bird, 36-719303, was banded when a nestling, by a party of Rover Scouts from Memphis, on May 24, 1936, in a heronry near Glen Allan, Mississippi.—BEN B. COFFEY, JR., 672 N. Belvedere, Memphis, Tennessee.

Melanism in the Black-crowned Night Heron.—During a field trip to the McGuiness Slough at Orland, Illinois, on August 7, 1937, Mrs. Amy G. Baldwin, Mr. C. T. Clark, both of Chicago, and the writer had opportunity to observe an abnormally dark heron of the species *Nycticorax n. hoactli*. So pronounced was the melanism that upon first seeing this bird from the rear while it stood on a post and preened its under-wing feathers, one of the party felt it was a cormorant; but that it was a heron became perfectly evident when the bird assumed its natural standing position. This together with the shape of bill and the size reduced the problem of identification to either the Yellow-crowned or the Black-crowned Night Heron. The entire body was a lusterless, somewhat slaty blue-black color with no apparent streaking on either breast or back. Mr. Clark mentioned that the back feathers appeared to be edged slightly, though this might have been the effect of strong light on the ruffled and slightly wet feathers. The head and neck were brown, almost a reddish brown, and were lightly, but noticeably streaked. Though superficially this plumage recalls that of the adult Little Blue Heron, other details of description mentioned here will obviate any doubts. The bill was black and the feet appeared dark, not yellow as in typical Black-crowns. Upon observing this bird in flight with several Black-crowned Night Herons, the size and manner of flight of the former proved to be identical with those of the latter, thus eliminating all doubt that it was anything but a melanistic Black-crown. Though to my knowledge Night Herons

do not nest in the immediate vicinity of the McGuiness Slough, they gather there in large numbers in late summer and roost preferably in the trees of one wooded hill at the northeast end of the slough, where the melanistic heron was discovered. Yellow-crowned Night Herons (*Nyctanassa v. violacea*) are of rare occurrence in the Chicago region; our most recent record is that of Mrs. Baldwin, who observed one at the McGuiness Slough on May 25, 1937.—FRANK A. PITELKA, *Lyons, Illinois*.

Notes on Colorado Geese.—We have had occasion to visit the Colorado College Museum in Colorado Springs, the Colorado University Museum at Boulder, the State Teachers College at Greeley, and the State Agricultural College at Fort Collins, Colorado, and have been surprised at the scarcity of specimens of geese of various species collected in Colorado. Inasmuch as the nomenclature has been changed in recent years it seems worth while to give a short résumé of the status of various species and subspecies recorded from our State.

LESSER SNOW GOOSE, *Chen hyperborea hyperborea*.—There are many observations for this form from the State and Bergtold ('Guide to the Birds of Colorado,' 1928) considers it a common bird in October. There are, however, comparatively few specimens in state collections and only five skins are in the Colorado Museum of Natural History. An adult male (C.M.N.H. no. 3179) and an adult female (no. 9768) were taken near Masters, Weld County, Colorado, on March 29, 1914, and November 26, 1923, respectively; an adult female (no. 12367) was collected November 11, 1933, and an immature female (no. 14192) on October 23, 1921, in Adams County. Adult female (no. 14710) taken at Loveland, Larimer County, Colorado, April 9, 1899, which was obtained from the State Historical Society's collection, is the specimen recorded by W. L. Selater ('A History of the Birds of Colorado,' 1912) as the Greater Snow Goose.

GREATER SNOW GOOSE, *Chen hyperborea atlantica*.—This species has been recorded as a straggler in Colorado. Selater (l. c., 1912) gives two definite records: one taken by Z. H. Snyder at Greeley, Weld County, Colorado, March 20, 1895, which we have been unable to trace; the other, an adult female collected by J. F. Campion on April 9, 1899, near Loveland, Larimer County, Colorado, formerly in the State Historical Society's collection. The latter bird is now in the Colorado Museum of Natural History collection (no. 14710). It is undoubtedly typical *hyperborea*. In view of the eastern range of *atlantica*, and the questionable records upon which the race has been included in the list of Colorado birds, we believe that *atlantica* should be dropped from the Colorado state list.

ROSS'S GOOSE, *Chen rossi*.—Felger (Auk, 24: 211, 1907) recorded the only specimen known from the State, taken near Longmont, Boulder County, by Captain Eli, on December 23, 1906. This skin is now in our Museum collection (no. 416). Bergtold (l. c., 1928) states there are "perhaps two records," but we have been unable to locate another one.

WHITE-FRONTED GOOSE, *Anser albifrons albifrons*.—This bird is more common in Colorado than specimens in collections would indicate. There are only three specimens from the State in the collection of this Museum: an adult male (no. 9767) collected by G. H. Duffield at Eads, Kiowa County, Colorado, on December 3, 1923; an immature female (no. 9880) taken near Brighton, Adams County, Colorado, by T. H. Smith on October 1, 1921; and another immature female (no. 12506) taken by E. A. Stephens at Milton Lake, Adams County, Colorado, on October 6, 1928. All three specimens agree with Swarth and Bryant's (Univ. of California Publ. Zool., 17: 209-222, 1917) measurements for *albifrons*. A band of fifteen birds wintered in

1936-37 on Barr Lake, Adams County, Colorado, and were observed on several occasions by the undersigned.

CANADA GOOSE, *Branta canadensis canadensis*.—This is the common goose in Colorado, although there are comparatively few specimens in collections. During the winter of 1936-37, several hundred birds wintered on Barr Lake, Adams County, and vicinity, where we saw them on many occasions.

HUTCHINS'S GOOSE, *Branta canadensis hutchinsi*.—This subspecies has been considered a common migrant by Bergtold (l. c., 1928) on the basis of sight records of small *Branta*, apparently. We find only one specimen, however, recorded by Sclater (l. c., 1912) from the State Historical Society's collection as a definite record. This bird, a male, which was taken near Loveland, Larimer County, Colorado, on April 10, 1898, by J. F. Campion, is now in the collection of this institution (no. 14709) and we find that it is *Branta canadensis leucopareia*, as described by Taverner (Ann. Rept. Nat. Mus. Canada, 1929). It is a light-bellied bird and measures as follows: culmen, 39.5 mm.; wing, 425 mm.; tarsus, 71 mm. On the basis of the above, and the lack of other records, we suggest that *hutchinsi* be dropped from the Colorado state list.

CKACKLING GOOSE, *Branta canadensis minima*.—This small goose is included in the list of Colorado birds on the basis of one record, given by Sclater (l. c., 1912). This specimen was taken April 10, 1898, near Loveland, Larimer County, Colorado, by J. F. Campion, on the same date as the bird heretofore considered as *hutchinsi*. This specimen, now in the Colorado Museum of Natural History collection (no. 14708), was obtained from the State Historical Society's collection, and, like the above, must be considered as *leucopareia*. It measures: culmen, 37 mm.; wing, 385 mm.; tarsus, 66.5 mm. *Branta c. minima* should be dropped from the Colorado list, as it has been included on the basis of this single specimen.

LESSER CANADA GOOSE, *Branta canadensis leucopareia*.—Small *Branta* occur uncommonly in Colorado. Although the naturalists of this Museum have tried for years to obtain specimens from game clubs and sportsmen, only one has been secured. It is an adult female (no. 11378) and was collected at Masters, Weld County, Colorado, by Thomas Holland, on November 10, 1925. This, and the two specimens mentioned above (adult female no. 14708 and adult male no. 14709), taken near Loveland, Larimer County, Colorado, on April 10, 1898, by J. F. Campion, are the only ones of this race represented in our collection. Occasionally small geese are observed in flocks of *canadensis*, and it is probable that they should be referred to as *leucopareia*.

AMERICAN BRANT, *Branta bernicla hrota*.—Sclater (l. c., 1912) lists this as a State bird on the basis of one shot, but not preserved, by Captain Thorne, at Fort Lyon, Bent County, on April 11, 1883. He says there can be little doubt about its identification, but it seems to us that the data are too questionable and that the race should be dropped from the list of Colorado birds.—ALFRED M. BAILEY AND ROBERT J. NIEDRACH, *Colorado Museum of Natural History, Denver, Colorado*.

Mexican Turkey Vulture in southern Florida.—Several years ago Dr. Alexander Wetmore, while examining bone fragments taken from Pleistocene deposits near Saint Petersburg, Florida, found bones of a Mexican Turkey Vulture (*Cathartes aura aura*) in a good state of preservation, and, at the time, suggested to me the possibility that this southern race might well be still the breeding bird in the extreme southern part of Florida. Unfortunately no skins were available in any collections to verify this conjecture, and it was not until this past spring that the opportunity presented itself to obtain a small series of these birds from the Cape Sable region.

On March 18, 1937, while engaged in field work at Cape Sable with Mr. Arthur H. Howell, of the Bureau of Biological Survey, and Mr. John B. Semple, of Coconut Grove, Florida, Mr. Semple, at my suggestion, collected a male Turkey Vulture near Flamingo that, from its measurements, apparently represented the southern race. This skin was sent to Dr. Harry C. Oberholser for identification and on being advised by him that it actually was *aura* and not *septentrionalis*, Mr. Semple, with characteristic zeal, collected nine more specimens from this same area for the Biological Survey collection. Of this number, four males, taken March 25, April 1, and April 6, likewise proved to be this southern form; the remaining five were the common Turkey Vulture of the eastern United States. Further study will be necessary to determine the abundance and northern limits of *Cathartes aura aura* in southern Florida, but it would seem now that this southern race, heretofore completely overlooked in this region, is a relatively common bird, at least as far north as Miami. I am indebted to Mr. Semple for the privilege of recording the circumstances under which this species was, for the first time, definitely added to the list of birds known to occur in Florida.—THOMAS D. BURLEIGH, *U. S. Biological Survey, Gulfport, Louisiana.*

Black Vulture following aeroplane.—On March 12, 1935, as I was attending to my duck banding in my wildfowl refuge near Avery Island, Louisiana, I heard the noise of an aeroplane, and glancing up, saw what I supposed were two planes—one a little in advance of the other. As they came nearer, coming over me, I looked up and saw that what I had taken for a second aeroplane was a Black Vulture (*Coragyps atratus*) following the plane a little below it, and about two hundred feet behind it. This bird was sailing, and kept, as nearly as I could judge, exactly the same distance behind this plane, as far as I could see it. The thing was so incredible, that I failed to make public note of it.

On December 20, 1937, at fourteen minutes of twelve, I, with my daughter, Mrs. Harold G. Osborn, whose home is in Ponca City, Oklahoma, was out in my wildlife refuge. The noise of an aeroplane attracted our attention, and my daughter said, "There are two of them—one small one a little lower and following the other." As they came nearer, I looked a second time, and saw that what we had taken for a second plane was a Black Vulture sailing at about two hundred feet behind and a little lower than the aeroplane. This bird did not flap its wings, as far as I could see it, and kept, as nearly as we could judge, exactly the same distance behind the plane as when first seen. We watched until they were both out of sight to the east. On both occasions, the plane sighted was the mail plane running between Houston and New Orleans, and the flight was from west to east. According to the Post Office Department at New Orleans, the approximate speed of these planes is from 127 to 160 miles an hour. In order to give positiveness to this statement, I am having my daughter, Mrs. Osborn, sign it with me, as I deem it a most unusual exhibition of bird speed!—E. A. McILHENNY AND ROSEMARY McI. OSBORN, *Avery Island, Louisiana.*

Black and Turkey Vultures in Westchester County, New York.—On the afternoon of May 7, 1936, following a week of steady southerly winds, I observed a Black Vulture (*Coragyps atratus*) near the town of North Salem, at the northern end of the county. With the alternate flapping and sailing flight characteristic of the species, the bird circled several times overhead at an altitude so low that its points of identification could be established even without the aid of the eight-power binocular through which it was examined: the wings shorter and broader than in the Turkey Vulture; the circular, silvery patches on the underwing at the base of the primaries

(several of which were broken); the short, spread tail; and even the black head and livid feet. I may add that I am familiar with the two vultures in both the southern States and South America.

More interesting than the addition of another record of the Black Vulture to the very few existing for the State (where it is regarded as accidental or casual by Chapman), has been the phenomenal increase of Turkey Vultures (*Cathartes aura septentrionalis*) in this county during the last decade. Until recent years the species was known from the region by only one record, in 1922. My first was in June, 1925. Since then the bird has become ever more frequently observed in northern Westchester County, until now it must be considered a common transient. With March 17, 1935, as the date of its earliest arrival (recorded by Louis J. Halle, Jr., Pound Ridge, whose experience with the species locally parallels my own), the period of its maximum abundance extends from the beginning to the end of May, when four birds at once may frequently be seen in the sky, rarely as many as six. One or two at a time are met with commonly throughout June and the first three weeks of July. After that it is exceptional to find any until the southward migration, which begins during the last week of August. The species is not quite so common in autumn as in spring. October 12, 1934, is my latest date. The question of whether it breeds here remains open, and the object of this spectacular annual migration is a provoking mystery, deepened by the status of "rare" in the Bronx region, forty miles to the south, accorded it by Chapman in 1932.—CHARLTON OGBURN, JR., *Salem Centre, New York*.

The proportion of sexes in hawks.—In the older European literature it is frequently stated that a considerable surplus of females exists among hawks. The proof most frequently quoted is that a female killed at the nest will soon be replaced by a new female, while the nest will be abandoned if the male is killed. This seems to be true for the European Sparrow Hawk (*Accipiter nisus*) and for the Goshawk (*Astur gentilis*), but the fact does not necessarily prove very much. It is possible that one of the biological functions of the male is to hold nest and territory, and that the female will go in search of a new mate if the "holder of the territory" is killed. However, in some of the cases in which the sex ratio was determined in the genus *Accipiter*, the preponderance of females was fully substantiated. Gunn (Proc. Zool. Soc. London, p. 67, 1912) examined two nests of *A. nisus* in England and found in one nest one male and five females, in the other two males and four females. E. Maniquet (Rev. Franç. d'Ornith., p. 423, 1927) examined three nests in France, and found only four males among the fifteen young. The total sex ratio of the five broods would be seven males to twenty females, or three females to every male. Stanley's figures (Journ. Morph., 61: 333, 1937), which seem to indicate an equal sex ratio, are inconclusive because he does not state to how many nests the young belonged nor whether or not all the young of each nest were examined. In the Goshawk flight of 1936-37, among 291 specimens killed in Pennsylvania there were 110 males and 181 females (Auk, 55: 124, 1938). It is of course possible that this unequal sex ratio is due to the greater migratory urge of the females, and only an investigation of nests can establish the true sex ratio.

Hawks are, as a rule, monogamous, but the existence of a surplus of females has led to polygamy in exceptional cases. There are at least two cases known in the Sparrow Hawk (*Accipiter nisus*) where two females laid in the same nest and tried to raise their broods under the protection of a single male. The conditions that apply to certain species of the genus *Accipiter* do not necessarily hold true for the other

hawks. We know very little about *Buteo*, but one case is reported in which the male left the nest after the female had been shot, and joined another pair. In the American Sparrow Hawk (*Falco sparverius*) I know of a pair in which the lost partner was repeatedly replaced whether it was the male or the female. A case is reported of two female Kestrels (*Falco tinnunculus*), that were mated with the same male and laid eggs in the same nest (or rather hollow) (British Birds, 19: 180, 1925). In the genus *Circus* (harriers) polygamy has been reported for three species (*cyaneus*, *pygargus*, and *hudsonius*). In all cases the two females that belonged to one male had separate nests. On the other hand, there are reports that in pairs of the Marsh Harrier (*Circus pygargus*) the lost male is as readily replaced as the female (Journ. f. Ornith., 75: 430, 1927, and Naumannia, p. 400, 1854).

All these observations indicate that there may be a surplus of one sex in certain species of hawks. It seems definitely desirable to pay more attention to this question and to publish all the available data on the proportion of the sexes among the young in the nest.—ERNST MAYR, *American Museum of Natural History, New York City.*

Eastern Goshawk nesting in central Michigan.—On April 16, 1937, the writer found a nest of the Goshawk (*Astur atricapillus*) in the Houghton Lake Forest, in Roscommon County, Michigan. Dr. Josselyn Van Tyne, Curator of Birds at the University of Michigan, believes that this is the southernmost nesting record for the State. The birds had chosen a site in a dense stand of white birches and quaking aspens less than fifty feet from the fire lane. The nest was situated in a crotch formed by several main branches of a white birch at a height of twenty-five feet from the ground. Three old nests in the immediate vicinity indicated that the hawks had been using this area for several years. The female remained on the nest until I approached the base of the tree and then flew off with a harsh scream longer and shriller than the *cuck-cuck-cuck* of the Cooper's Hawk.

On May 21, Mrs. Baumgartner and Miss Margaret Gross visited the area and heard a young bird peeping feebly after the old bird had left the nest. Two days later Mrs. Baumgartner climbed to the nest and found one very small nestling and one addled egg. I quote from her field notes: "The nest was very bulky, composed of fresh sticks and lined with green white-pine and hemlock twigs and a few shreds of bark. The young bird, at least two days old, was covered with grayish down with pinkish skin showing through. The cere and feet were yellowish horny; the bill black, pearl gray at the union with the cere; the egg tooth, still present on May 25, was white; the inside of the mouth pale pinkish. Its soft call notes in the nest, probably for food or warmth, were a gentle clitter not unlike that of young Horned Owls, *k-k-k-k-k*. The cry of fear or annoyance when handled and photographed was a loud scream."

On May 25, Dr. Arthur A. Allen and Mr. Albert R. Brand managed to reach the nest with the Cornell University sound truck and made movies and recordings of both the old and the young birds. With the exception of a threatened assault upon one of the Cornell party, the old bird never attacked, although two persons climbed to the nest and the young bird, protesting loudly, was brought down for photographing. Only one adult, the female, was ever seen in the region. The writer visited the nest area at the end of June but found no evidence of the birds. It is hoped that the nesting may have been successful and that the area will be inhabited again another year.—FREDERICK M. BAUMGARTNER, *Department of Conservation, Lansing, Michigan.*

Early nesting of the Short-tailed Hawk.—Since any reference these days to the Short-tailed Hawk (*Buteo brachyurus*) is of interest, it is with peculiar pleasure

that the writer is able to record what appears to be the earliest nesting date of this species yet known. Search of the literature at any rate, reveals none that approaches it. On January 20, 1937, a nest was discovered by the bird flying out of the tree overhead as we passed. Accompanied by Robert P. Allen of New York City, and Earle Moore of Miami, the writer was in the hammock bordering Deep Lake, Collier County, Florida. Walking down a rough road through the hammock, a disturbance in the dense foliage overhead took place, and a beautiful adult Short-tailed Hawk in the black phase left a cabbage palmetto a few yards from the road, and soared about close overhead. A short search of the tree revealed the nest, built close to the trunk amid the stems, in exactly the same manner as that employed by the Caracara. It was about twenty-eight feet up. The tree was photographed at close range, and another picture secured of the general vicinity. Other nests found in Florida seem to have been in the months of March and April, though in his "Egg Dates" Mr. Bent states on page 258 ('Life Histories of North American Birds of Prey,' part 1) that for Florida and Mexico there are fourteen records, February 12 to June 10.

In his field work in Florida, the writer has met with this species four times in three years; the localities are Royal Palm Hammock, Collier County; near Flamingo, Cape Sable; "Pinecrest" on the Loop of the Tamiami Trail; and Deep Lake. One other nest has been seen; it was built in a red-mangrove tree overhanging Shark River, on the southwest coast, and contained two eggs. This date was March 16, 1937; a good picture was secured of the nest and eggs.

On page 255 of the 'Life Histories' of the birds of prey, Mr. Bent states in reference to Lake Istokpoga, that "this lake is the only recently known breeding locality and I now believe that these hawks have been extirpated even there." In view of this, the records of the two nests above are of particular interest. One more can be added of which the writer has knowledge. In late March 1937, a nest of this species was found in the Pinecrest area of the Loop, Collier County, by J. Earle Moore, of Miami, one of the companions of the writer mentioned above. He followed the history of the nest from its discovery, when it held three eggs, to the time that the young left it. There is a peculiar coincidence in the date of the March nest seen by the writer, and photographed at Shark River. It was found on March 16, the same date as that of the first nest ever to be found in Florida, which was March 16, 1889, by W. E. D. Scott. The Shark River nest was discovered by Edward J. Reimann, one of the Audubon wardens on the southwest coast, and was shown to the writer on his March inspection of that area.—ALEXANDER SPRUNT, JR., *National Assoc. Audubon Soc., Charleston, South Carolina.*

Bald Eagle takes live fish.—It is commonly known that the Bald Eagle (*Haliaeetus leucocephalus*) subsists on dead fish, carrion and fish taken from the Osprey after the latter has made the catch. Occasionally it takes live birds and small mammals. On the southwest coast of Florida, at Turkey Key, Monroe County, about eighteen miles south of Everglades, Florida, on November 13, 1936, I saw a strange sight. At this time of the year mullet are running, and the fish school in great masses to spawn. On the above date I happened upon one of these schools and saw six Bald Eagles (four adults and two immatures) actually fishing for themselves. As the fish stay near the surface, they were easy to take. The eagles circled directly over the school, about fifty feet above the surface of the water. One would break away, go about one hundred yards off, and then start out at full speed toward the school, gaining momentum and setting its wings in a long diagonal glide down to the surface. It would then reach down to the water, immerse one leg and scoop out a

fish, never stopping for a second. It did not dive into the water like an Osprey, but just skimmed above the surface, grasping the fish in the talons of one foot. Never did I see the eagles immerse more than one leg. Only one bird was seen doing this at one time, while the others would wait until one made a catch and flew away; then another would go through the same procedure. This is the first time I have ever seen an eagle take a live fish from the water.—EDWARD J. REIMANN, Box 81, Everglades, Florida.

Pigeon Hawk at Cape Hatteras, North Carolina.—On November 25, 1937, while I was passing the Pea Island Coast Guard Station, Chicamacomico Island, North Carolina, in company with Grover Pitts and J. D. Asher, my attention was called by Mr. Asher to a small hawk perched on a low post near some old buildings. The bird displayed a remarkable lack of fear, permitting us to approach within thirty feet before it flew a short distance and alighted upon a low stake. It was easily identified as a Pigeon Hawk (*Falco columbarius* ssp.).

Pearson, Brimley and Brimley ('Birds of North Carolina,' North Carolina Geol. and Economic Surv., 4: 173-174, 1919) state: "The Pigeon Hawk appears to be a rare transient in this state, our only records being October 1, 1886; April 21 and April 23, 1888; April 19, 1902; September 10, 1910; and October 4, 1914, all from Raleigh, a single specimen being taken each date. Cairns secured a female in Buncombe County on October 19, 1894."

A specimen of this species was taken by the writer near Raleigh, in April 1932, and presented to the Zoology Department, North Carolina State College of Agriculture and Engineering.

The identification of this hawk at Cape Hatteras is the only known record of its occurrence along the North Carolina coast.—OTIS BOYD TAYLOR, *National Park Service, Richmond, Virginia.*

Additional notes on breeding of Black Pigeon Hawk.—Since publication of my notes on the range and probable breeding of the Black Pigeon Hawk, *Falco columbarius suckleyi* (Auk, 52: 305-307, 1935) additional verifying evidence has come to hand. Since not only the breeding range but the validity of this race have been questioned (H. S. Swarth, Condor, 36: 40, 1934), these new notes may be worthy of record.

Because this bird was recorded as present during all months of the year on Vancouver Island as far north as Comox, British Columbia, there was a near certainty that it bred here. On June 19, 1935, a supposed nesting pair was discovered near the trail to the Forbidden Plateau well up in the heavy timber of the hills at about 2500 feet elevation. The shrill nesting cry of the birds called attention to them and the male was seen to bring food to the female on a high perch. That he did so, and that she accepted it as though it were her due, left little doubt of the relationship. A nest seemed quite certainly somewhere in the vicinity, but though I returned to the spot on the morning of June 22 and remained camped in the vicinity for two days, watching constantly, no clue to a nest could be secured. The birds were seen and heard on several occasions. Again on July 2, I returned to the scene, spending the day and part of the next on the spot, seeing a pigeon hawk once but getting no further clue to the supposed nest. The timber here was dense and tall—western cedars, western hemlocks, Amabilis firs and some huge Douglas firs—but to increase the difficulties of the situation, the Gray Jays at hand were mimicking the squeal of the pigeon hawk so perfectly as quite to confuse the problem.

Better luck attended later field operations that year (1935) when on the evening of

July 20 the shrill cry of pigeon hawks was heard in the timber near camp at the foot of Upper Campbell Lake, Vancouver Island. Next day again in the evening as I back-packed supplies down the trail to Snake Lake, the same cry was heard and a Band-tailed Pigeon winging over the woods was seen suddenly to sheer off its course as a little male falcon shot into view and took after it. The chase passed out of sight in a moment but a closer scrutiny of the tops of the trees at hand disclosed another small pigeon hawk sitting motionless and suggesting a young one just out of the nest. On returning to the main camp again on the 24th, a family of noisy young merlins was found in the woods where these birds were first seen. The young were now out of the nest, perching high in the tall firs and cedars and calling for food in their usual shrill-voiced manner. That the young were very close to their nest site was evident and this was proved next day, July 25, when one of my assistants, R. E. Luscher, shot one of the very immature young. This specimen, definitely establishing a breeding location for this subspecies, is now in the National Museum of Canada, Ottawa.

During field work in the summer of 1936, carried out on the mainland coast opposite Vancouver Island, no pigeon hawks were noted until the young were out of hiding and migration was under way. Several times during a stay at Grassy Bay, Loughboro Inlet, August 17 to September 9, pigeon hawks of the black type were noted, but two specimens taken later at Kingcome Inlet, September 19 and 20, both juveniles, were not of the black, but of the paler eastern type. In a consideration of the pigeon-hawk problem, however, too much must not be made of this occasional infusion of the eastern form as during migration and winter a great many eastern birds come to the coast, apparently striking the heads of the inlets or rivers flowing into them, and so following down with the coastal migration. Thus a Northern Water-Thrush was taken August 27, this same season (1936) at Grassy Bay, Loughboro Inlet.

The season of 1937, with operations in the Rivers Inlet region of the mainland coast, brought more interesting notes, when at the head of the inlet pigeon hawks were seen two or three times in June, and in mid-July a breeding pair was located at Owikeno Lake. On July 14, I heard the familiar cry in the heavy timber on the north side of the lake near the outlet and next day the source of the disturbance was located—a family of three or four young just out of the nest. In such huge timber, Sitka spruce, Amabilis fir, western hemlock and western cedar, there seemed no way now to locate the actual nest site, but as in several days' observation the young did not move over more territory than a scant acre, it is a certainty that they were very close to the nest. Both old and young remained at nearly all times so high as to be out of gunshot and it was only by means of "gang-shooting," with the help of assistant Charles J. Guiguet, that specimens could be obtained. One juvenal female and the adult female were taken, July 16 and 17, respectively. The male continued to feed the remainder of the family.

The amount of small-bird life taken to support a breeding pair of these little hunters must be considerable. The young female taken was very fat and the adult also was in prime condition. Despite the fact that the little male parent was working alone (the female having been lightly winged on the 15th and lost in the timber till retrieved on the 17th), the young one that was shot had its stomach crammed by 11 a.m. Mr. Guiguet previously had reported seeing a merlin strike down a Black Swift in a beautiful stoop above the outlet of the lake.

Regarding the coloration of this little-known subspecies, the above specimens—now in the National Museum of Canada—again bear out the fact that there is almost

no difference of plumage color between the adult female and the young of the year. The young female, here taken so early that the first two primaries were short, the tail also abbreviated, and evidences of down still on the head, differed only in the color of the soft parts; the toes and tarsus, cere and eye area were pale greenish in the young and more yellowish in the adult female. In neither is there the rich yellow of the soft parts of the adult male. The latter alone assumes the wondrous blue slate of the upper parts. These in adult female and young of both sexes are dark sooty blackish. In the matter of the markings of the primaries of these specimens, though the Campbell Lake juvenal male carries the spots or 'islands,' the Owikena Lake specimens, both adult and young, rather favor the cross-bar markings: the adult female was barred but faintly 'islanded,' while the young female—though the outer primaries are not fully grown—was even more distinctly barred. Just what may be considered typical of *Falco c. suckleyi* in this respect is a matter of opinion. In a series of eighteen Vancouver Island specimens of this black race in my collection, these primary spottings range from the well-defined bar as in the eastern race, to an almost complete absence of marking in both adult and young. But despite this variable marking of wing or varying width of outermost tail-band, these dark-plumaged birds resident and breeding in a wide area where the more eastern race of *Falco columbarius* is absent or rare, must be referred to *Falco c. suckleyi* and these notes are offered to establish more completely this race in its home in the coastal strip.—HAMILTON M. LAING, Comox, British Columbia.

Two specimens of the Heath Hen from New Jersey.—The Academy of Natural Sciences of Philadelphia has recently acquired two mounted specimens of the Heath Hen (*Tympanuchus cupido cupido*), both killed in Burlington County, New Jersey.

On October 1, 1937, Mr. R. J. Sim of Riverton, New Jersey, while photographing old houses, was shown by Mrs. Thomas Harrison near Wrightstown, a mounted Heath Hen which was given to her by her father. Mr. Sim told me of his find and together we drove down to see it. Mrs. Harrison said, later confirming by letter, "There were three Heath Hens together; my father shot one and had it mounted. He killed it at least forty-five years ago on the farm where he lived, known as 'Howard Hill.' This farm is located in the northeast corner of Burlington County, New Jersey, where Mercer and Monmouth Counties join Burlington County. It is in North Hanover Township, which was then called New Hanover Township. It being an unusual bird, he had it mounted." It is a male bird and in very good condition. As Mrs. Harrison is well past sixty years of age the "at least forty-five years ago" is a modest way of expressing lapsed time, for she told me it had "always been in the parlor." I brought the specimen to the Academy and compared it with our series from Martha's Vineyard. Later I took it to the American Museum of Natural History, New York, where Dr. Frank M. Chapman very kindly compared it with the series in that institution. It apparently answers all of the requirements of *cupido*.

About ten days after acquiring the above specimen, I received a letter from Mr. Thomas C. Shreve of Moorestown, New Jersey, saying that he had a Heath Hen. This second specimen is in better plumage and is apparently an older male bird than the one from Wrightstown. The Shreve family for the past three generations, were all enthusiastic sportsmen, owning bird dogs and hunting throughout New Jersey. Mr. Shreve wrote me as follows: "This Heath Hen was killed by Joshua E. Shreve prior to the year 1850 at Onga Hat, Pemberton Township, Burlington County, New

Jersey. Joshua E. Shreve was my grandfather. This information was given to me by my father, Borgillea R. Shreve."

I feel sure there are more Heath Hens hidden away in some of the old houses in Burlington County. It is to be hoped they will find their way eventually into museums where they may be preserved.—WHARTON HUBER, *Academy of Natural Sciences, Philadelphia, Pennsylvania.*

American Coot in Puerto Rico.—Although a number of references to the American Coot (*Fulica americana americana*) in Puerto Rico may be found in the literature, these are all either erroneous or at best extremely doubtful, and in most, if not all cases pertain to *Fulica caribaea*. Accordingly *F. a. americana* has not been included in recent lists of the birds of the island. As this species is known from Hispaniola to the west and St. Croix to the east of Puerto Rico, it was no great surprise when on January 4, 1936, Mr. J. A. Ramos collected a male at Cartagena Lagoon. It was in a large flock of coots from which he also collected several *F. caribaea*. The specimen is now in my collection. It weighed 497.6 grams.—STUART T. DANFORTH, *University of Puerto Rico, Mayagüez, Puerto Rico.*

Purple Sandpiper in Ohio.—On December 27, 1937, we found on a partially ice-covered breakwater at Fairport Harbor, which is about thirty-five miles east of Cleveland, Ohio, on Lake Erie, a lone Purple Sandpiper (*Arquatella maritima*). We approached to within thirty-five feet and could see clearly the characteristic slaty coloration of the back and throat, and the whiteness of the under parts. Back on January 2, 1938, we again found the bird. This time it came closer and closer until it was but a scant six feet from where we crouched against the icy rocks. Now we could see clearly the bright yellow of the legs and of the base of the bill. After a minute or so, the sandpiper became alarmed, and flew off down the breakwater.—JAMES AKERS AND GORDON SPARE, *East Cleveland, Ohio.*

Red Phalarope at Oyster Bay, Long Island.—On April 25, 1937, Mr. Richard Allyn of the Columbia Medical School, and I observed two Red Phalaropes (*Phalaropus fulicarius*) in the pond of the Oyster Bay Bird Sanctuary at Jones Beach, Long Island, New York. The bird first seen was in the pale winter plumage and was observed at a distance within twenty feet as it was feeding along the shore like a sandpiper. It then flew a short way over the water showing plainly its white wing stripes. On the water the bird rode the small waves jauntily, but occasionally darted here and there, with searching bill, dipping into the water for food. At other times, it spun rapidly for one or two revolutions as if on an axis. The second bird was a female in breeding plumage. Its reddish breast, white area on the sides of the head, and the yellowish bill were readily seen with the binocular at a distance of about one hundred feet. On May 9, Mr. Allyn and I again found the female Red Phalarope and three others in winter plumage on the Sanctuary pond. This is a very rare bird on fresh water in the Long Island area in spring.—CLEMENT B. P. COBB, M.D., *1261 Madison Ave., New York City.*

Red Phalarope in Michigan.—On the early evening of September 6, 1937, I found a Red Phalarope (*Phalaropus fulicarius*) at Whitmore Lake, Michigan. During my half-hour of observation, the feeding bird was frequently disturbed by motor-boats and other craft, which forced it to fly from one portion of the lake to another. In flying about, the phalarope alighted in both Washtenaw and Livingston Counties, the two counties in which the lake is situated. The specimen was collected, and has been deposited in the Museum of Zoology of the University of Michigan. Examina-

tion of the specimen disclosed it to be an immature female. Dr. J. W. Leonard of the Institute for Fisheries Research examined the food in the partly filled stomach. This food consisted of numerous small Diptera of the series Brachycera; many small Hymenoptera of the family Chalcididae; several minute Coleoptera of the suborder Rhynchophora; several fragments, in early instar stages, of Hemiptera of the family Gerridae; a few fragments of Ephemeroptera; and sparse fragments of a terrestrial arachnid. Because of the finely triturated condition of the contents, generic and specific determinations of the remains could not be made. In an examination of thirty-six stomachs of the Red Phalarope that were taken from the vicinity of the Pribilof Islands (Alaska), New York and Maine, Dr. Alexander Wetmore ('Food of American Phalaropes, Avocets, and Stilts,' Bull. U. S. Dept. of Agric., no. 1359, p. 3, 1925) found that Crustacea was the group of animals best represented. No free-swimming Crustacea or other planktonic forms were found in the stomach of the Whitmore Lake bird, although at the time of capture the lake contained a large pulse of these animals, of which some forms were comparatively large in size. The Red Phalarope has been recorded previously only about five times in Michigan.—MILTON B. TRAUTMAN, *University of Michigan, Ann Arbor, Michigan.*

Atlantic Kittiwake in Wisconsin.—On February 1, 1938, John Schaeffer reported a Kittiwake in the Milwaukee Harbor. On February 4, the Milwaukee Museum men took the bird for a specimen. It proved to be an Atlantic Kittiwake (*Rissa tridactyla tridactyla*) in immature plumage. While we have several sight records of the Kittiwake in Wisconsin (Dr. Hoy, 1853 and 1870, and Walter Mueller, 1930) this is, as far as I know, the first specimen taken in Wisconsin.—MURL DEUSING, *Milwaukee Public Museum, Milwaukee, Wisconsin.*

Unusual perching habit of the Black Tern.—While engaged on a sanctuary-inspection trip in Texas during June 1937, what seems to be a unique departure on the part of the Black Tern (*Chlidonias nigra surinamensis*) in perching, was noted by the writer, Robert P. Allen and Guy Emerson, of New York, and J. J. Carroll, of Houston, Texas. While passing the several bayous which make up part of the Guadeloupe River Bottoms, Victoria County, several hundred of these birds were seen fishing. Running parallel with the highway was a line of poles carrying wires, and many of the terns were resting on these! At some little distance, they were taken to be swallows, as it is a typical swallow habit; but of course, closer approach showed what the birds were. At the point where most of them were congregated, the line was no more than thirty or forty feet from the road. The terns were massed on the wires thickly, to the extent of several hundred, and many were leaving or alighting on the wires continually.

During Mr. Carroll's long residence in Texas and in spite of his extensive knowledge of ornithology, it was the first time he had ever seen such a thing, and it was utterly new to the rest of us. Subsequent inquiry among friends and acquaintances of the writer have failed to reveal anyone who has seen this done by the Black Tern. Observers in the New York City region have failed to recall the procedure in that area, at least those who have been questioned. Everyone to whom the writer has spoken has been so interested, that it seems advisable to ask whether anyone anywhere has noted this behavior of the species.—ALEXANDER SPRUNT, JR., *Natl. Assoc. Audubon Soc., Charleston, South Carolina.*

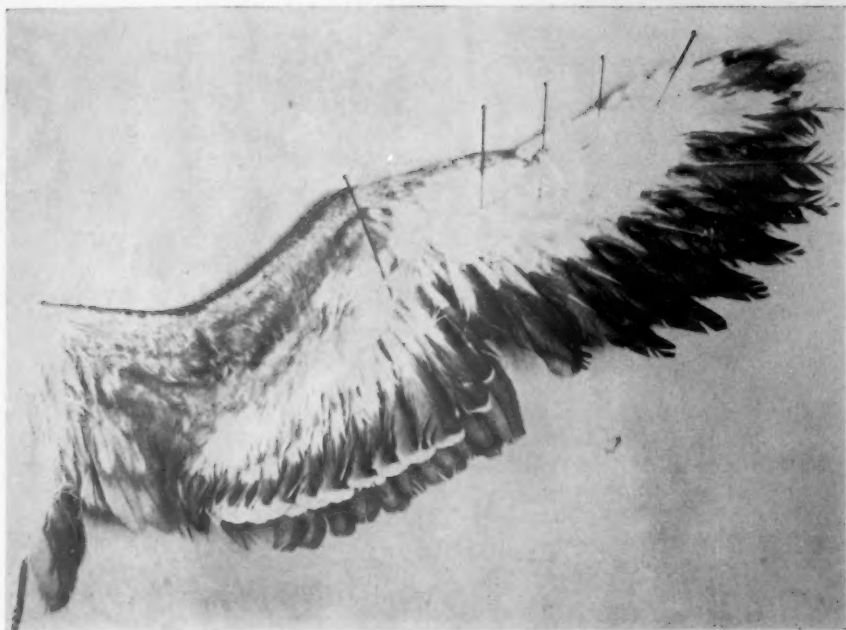
Development of remiges in the Atlantic Murre.—While the general appearance of the juvenal and the first-winter plumage of the Atlantic Murre (*Uria aalge aalge*) has been known for a long time, it has never been recognized that the young

bird at the time of leaving the nest island and going to the water has no remiges. The presence of well-developed greater, median and lesser coverts has led ornithologists to suppose that these were the small juvenal primaries and secondaries. Bent (Bull. U. S. Nat. Mus., no. 107, 1919) says: "There are no white tips on the secondaries in this plumage." The birds which Verwey (*Ardea*, vols. 11 and 12) examined, had apparently all developed the primaries and secondaries before they came in to the Dutch coast, and so he did not notice their absence in the young birds. But in a young bird which he took September 3, 1921, he noted that "all remiges are growing, they are also growing with distinct hornsheaths." In another young bird of October 15, 1921, he noted: "Primary coverts don't seem to be moulted."

The full significance of what Verwey just missed observing in these young birds came to me through my study of captive birds. In a paper read before the A. O. U. at the Quebec meeting in 1932, I described the development of the first flight feathers (primaries and secondaries) in the young bird as follows: "When the young birds are ready to leave the nest-island or ledge the greater coverts are from one inch to one and a half inches in length. By careful examination the very small neossoptiles on the primaries may be seen. After the bird has been in the water from three to four weeks (judging from captive birds) the first appearance of primaries and secondaries may be seen. All these feathers appear and develop at the same time, and the coverts which have up to this time been the main feathers of the wing apparently serve to protect the incoming soft primaries and secondaries from becoming broken as the wing is used in the dive. These coverts are retained and the primaries and secondaries grow rather fast. In about two weeks they will have become greater in length than the coverts which have been protecting them. They are in every respect like the feathers of adult birds and, I believe, are retained through the first winter. The birds which Bent described (1919) as having no white tips in the secondaries had, of course, only coverts since at that age the remiges had not appeared. Apparently the young birds begin to develop this first set of flight feathers about one month after they leave the nest colony. In my opinion, they do not actually fly much before October."

One can readily see the many advantages such a plan for plumage development has. Since the young birds do not get into the water (on the North Shore of the Gulf of St. Lawrence) until late July or August and then as extremely undeveloped small birds, it would be a great hardship to moult a juvenal set of flight feathers and grow another set for the first winter. As it is, the small wing of the bird when it leaves the nest-island has some time to grow before these large flight feathers are produced. In the meantime well-developed coverts aid the bird in propelling itself under the water. The illustration (Plate 18, upper figure) shows the wing of a young captive Murre seven weeks of age with the white-tipped secondaries coming in under the coverts. The primaries have already developed beyond the length of their coverts.—ROBERT A. JOHNSON, 150 East St., Oneonta, New York.

'White-eyed' Murres in the British Isles.—In 'The Auk' (vol. 55, p. 59) Mr. R. A. Johnson makes the somewhat astonishing suggestion that selective collecting of individuals and eggs of the 'White-eyed' Murre may be responsible for the small proportion now occurring in the southern parts of the British Isles. On the Yorkshire Coast the colonies, which extended for several miles, have been encroached upon by Kittiwakes (*Rissa tridactyla*) and Fulmars (*Fulmarus glacialis*) of late years. Nelson, in 1907, estimated the annual take of eggs here at 130,000. This probably represents a little over two eggs from each pair, but even allowing three eggs per pair



JOHNSON: DEVELOPMENT OF REMIGES IN THE MURRE



SMITH: STARLING WITH MISSING UPPER MANDIBLE

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(which is almost certainly an overestimate), this would give at least 43,000 pairs. There are also vast colonies in Pembrokeshire and still more on the west coast of Ireland, where the eggs are rarely taken, if at all.

I think it would be difficult to find four hundred skins in the British Isles, and these have been collected at various dates during the last sixty years. Hardly any identified eggs of the ringed form exist, as no one regards it as a species, and on crowded ledges identification is impracticable.

The chief cause in the diminution of the species is the mortality caused by floating oil. This is a non-selective agency. There is now no shooting on the breeding grounds and it is only here that it would be possible to pick out any appreciable number of ringed birds. In 1864, there was a good deal of indiscriminate shooting at Planborough and it was easy for a collector to look over a boatload of slaughtered birds, but the shooting was non-selective and the demand for 'white-eyed' birds soon died out.—F. C. R. JOURDAIN, *Southbourne, Bournemouth, England*.

Early date for the White-crowned Pigeon on the Florida Keys.—On March 9, 1938, we saw a White-crowned Pigeon (*Columba leucocephala*) on Key Largo, Florida, about seventeen miles northeast of Tavernier. The bird, a female with ashy crown, was perched in a small tree near the road and gave ample opportunity for observation. This seems to be the earliest dated record for the State, although Howell ('Florida Bird Life') gives some undated winter reports from Cape Sable. It is also of interest as being from one of the uppermost keys. We saw no other pigeons on the trip which took us through to Key West.—J. J. MURRAY, *Lexington, Virginia*, AND ALEXANDER SPRUNT, JR., *Charleston, South Carolina*.

The last Passenger Pigeon killed in Wisconsin.—It would be difficult to find more contradictory and indefinite statements than those regarding the last Passenger Pigeon (*Ectopistes migratorius*), supposedly, killed in Wisconsin. W. B. Mershon ('The Passenger Pigeon,' p. 154, 1907) cites a letter from Neal Brown, dated May 20, 1904, in which the latter says: "It was, I think, three or four years ago, in hunting with Mr. Emerson Hough near Babcock in this State in September, we killed an unmistakable Wild Pigeon." On page 223, however, appears the categorical statement: "In 1900 Neal Brown of Wausau, Wis., killed one near Babcock, Wis., in September." In an unsigned article in the 'Saturday Evening Post' (October 15, 1910, p. 30), Hough states that "about ten years ago while hunting with two friends at Babcock, Wisconsin, one of the party killed a Passenger Pigeon." In the 'Passenger Pigeon in Pennsylvania' (1919), by John C. French, there is a note on page 189 by Henry W. Shoemaker stating that he was told by Emerson Hough "that the last Passenger Pigeon which he saw was killed by a retired railroad conductor, in Wisconsin, the first week in September, 1897. The conductor while journeying along a railroad cut, saw a large bird perched on a tree among a band of Mourning Doves." More recently (Aldo Leopold, *Trans. Wisconsin Acad. Sci.*, 30: 72, 1937) it is said: "The record ends with a single bird killed by Emerson Hough at Babcock about 1900."

Recalling that, at the time, Hough had a weekly column, "Chicago and the West," in 'Forest and Stream,' it seemed probable that more exact information was available. In fact, the details of the incident are given in volume 53, p. 148, September 23, 1899, of this publication. The bird was shot by the guide Varney, of Babcock, from a group of Mourning Doves sitting in a tree, while the party was hunting Prairie Chickens. It was recognized as a young Passenger Pigeon by Neal Brown. Hough states further: "The bird was about two-thirds grown and the plumage was pale and devoid of

the fine luster of the adult bird. The tail feathers were pulled out in the pocket of Varney's hunting coat, but I got them and have them now, with the skin of the bird, which I secured." The bird was shot between September 9 and 15, 1899.—A. W. SCHORGER, 168 N. Prospect Ave., Madison, Wisconsin.

A diurnal Horned-Owl courtship.—For several years I have been interested in a Pacific Horned Owl (*Bubo virginianus pacificus*) which I have seen at least once each month of the year, in the small canyon back of my home on the outskirts of the city of Pomona, California. Until recently I had never seen but one and while I had, of course, no means of knowing that I was always seeing the same bird, its fearlessness and activity in daylight seemed unusual enough to warrant my thinking it was always the same owl. Once in the late afternoon, it sat on a limb facing me, not more than fifteen feet away. The limb was bare, and the owl sat motionless in the center of it, instead of being perched near the trunk, and we watched each other for three or four minutes. Not until I made a quick motion with my hand and arm toward the bird did it fly away. Several mornings I have seen the owl in broad daylight perched in the live oaks in plain sight, and it has never shown any interest or concern in me, although it watched with keen interest my two dogs.

On January 15 of this year, for the first time I saw two owls, which were calling to each other, one using a much deeper tone than the other. Since that date, we have heard the four-note cry from these birds nightly. At 5.30 in the morning, one of them flies very close to the house, and gives its call repeatedly. On February 17 at ten o'clock on the morning of a beautiful, clear day, I heard hooting in the canyon, and went down to investigate. There, to my surprise, I saw the two owls perched on a live oak, about thirty feet from the path. One bird, which I assumed to be the male, was facing me, and was on a fairly high limb. The other, with its back to me, was perched on a lower limb, facing the male. The latter was hooting, a call of five parts—*whó, hoo-hoo, hoo hoo*—at intervals of about one minute. At each call the female would raise her ear-tufts, and, occasionally in response, would utter an indescribable, short cry—perhaps like the cat-call of a Catbird. Otherwise she sat motionless. This performance continued for fifteen minutes, and I was interested to note that the small birds in the vicinity seemed entirely uninterested in the owls, a Kinglet approaching the male within a few feet, and a pair of Hutton's Vireos continuing their search for food in complete indifference to the presence of the predators. Suddenly the male began to utter his notes in rapid succession, with no pause between, and the female's ears were kept very busy! Then, with a quick movement he flew at her. She flew up with a snarling note, they fought for a second, then both flew off and out of my vision. I can find no account of a daylight courtship of these birds, and wonder if it is an unusual event.—ETHEL CAPEN AYER, 1300 Hillcrest Drive, Pomona, California.

Burrowing Owl in the Florida Keys.—Having to be in Florida a great deal throughout the year in connection with field work, the writer has encountered from time to time, items of interest which apparently are not listed in the literature. Illustrative of this was his recent observation of the occurrence of the Burrowing Owl in the Florida Keys. At this writing it is not certain whether these birds should be referred to *Speotyto cunicularia floridana* or *S. c. hypugaea*.

Arthur H. Howell in his 'Florida Bird Life,' does not include the Keys in the range of *floridana* in that State. The nearest locality listed is Flamingo, which lies to the eastward of East Cape (Sable) and is on the tip of the peninsula. Even that was far out of the usual range, which is the general area of the Kissimmee Prairie, though the

bird is known to breed about the Miami area, where the writer has seen burrows at Hialeah and Opalocka. The geology of the Keys is anything but indicative of being good range for the Burrowing Owl, as it is almost entirely rock, with little soil anywhere. However, there are sandy patches on some of the Keys, notably Key Vaca and the vicinity of Marathon on that key. The A. O. U. 'Check-list' excludes the Keys from the range, but points out that allied races occur in the Bahamas, Haiti and other West Indian islands. *S. c. hypugaea* is said to winter "south to Panama." Thus, one is bound to consider the possibility that this bird may wander eastward to the Keys in winter. The Scissor-tailed Flycatcher (*Muscivora forficata*) certainly does so fairly regularly, even more so perhaps than one is led to believe from the literature. The writer found this species almost common in the Keys on the same trip in which the Burrowing Owls were observed. If the flycatcher comes to the Keys, the owl could do the same thing; there is more likelihood of that taking place than that the Bahaman birds come over.

At any rate, the occurrence seems to be something entirely overlooked heretofore. None of the observers who are familiar with Florida to whom the writer has appealed for information, has seen them in the Keys. None of the residents of the Keys seemed to know what was meant when asked about "ground owls." Natives of Tavernier, Matecumbe and Marathon were unfamiliar with them. The writer has spent a good deal of time in the Keys during the past three years but has not observed the birds hitherto and might not have seen them at all had it not been for the necessity of a night run from Tavernier to Marathon, a distance of some 48 miles. On the night of January 12, 1937, in company with Robert P. Allen of the Audubon Association's New York office, the round trip of 96 miles was made between 8.30 p. m. and midnight. The birds were flushed from the sides of the road and flew away in the beam of the car's headlights. The first three or four were not identified positively, for the appearance was very strange. A distinct impression of paleness was given, together with a sort of gangling posture in flight that was very peculiar. However, at about the fifth bird, one was seen in the middle of the road and the car slowed down and kept at very slow speed until the bird was within fifteen or twenty feet when every detail was apparent in the brilliant beam. That it was a Burrowing Owl was as plain as anything could well be. When it finally flushed, its appearance was identical with the others than had been seen earlier. After this, two others were seen, making a total of seven birds. One was seen in a small bush by the roadside and its eyes reflected the headlight beam beautifully. The localities were Lower Matecumbe Key, Long Key, Grassy Key and Key Vaca. The Over-seas Highway now travels causeways and bridges as far as Marathon without the necessity of a ferry, so it was possible to cover all these keys by car.

It is clear that some collecting should be done to establish definitely the identity of these Key Owls. It is probable that their occurrence has taken place for some time, and that they are almost entirely nocturnal which would account for the natives, being unfamiliar with them.—ALEXANDER SPRUNT, JR., *National Assoc. Audubon Socs., Charleston, South Carolina.*

Great Gray Owl in Connecticut.—On January 12, 1938, a large owl was discovered in a bare tree in the residential section of Hartford, though close to the business zone on a busy avenue where hundreds were passing during the noon hour. Just as soon as notified, I searched for and found this owl, and then studied it very carefully with a six-power binocular in five different locations covering perhaps half a mile in distance, and each time the bird was in a bare tree and up about forty

to fifty feet. I went very carefully over each field mark I could see from various angles and compared with the bird-book in hand, and made further search at home. Observation covered at least a half hour before the owl went beyond my view. Summing up everything with Mr. Arthur G. Powers, a careful observer who was with me all the time, I am positive that this big bird was a Great Gray Owl (*Scotiopteryx nebulosa*) in excellent plumage. So far as I have learned, this is the fourth occurrence of the Great Gray Owl in Connecticut since 1843, the last being one seen near New Haven in 1934.—GEORGE T. GRISWOLD, 47 Willard St., Hartford, Connecticut.

Sennett's Nighthawk in Ohio.—Studies of nighthawk migrations in Ohio during the past three years led the writer to re-examine skins in the Ohio State Museum collection. One specimen (No. 5291) taken many years ago, was so light in color that it was assigned to Sennett's Nighthawk (*Chordeiles minor sennetti*). This determination was recently confirmed by Dr. H. C. Oberholser of the Biological Survey. The bird, a male, taken September 18, 1900, at Jasper, Pike County, in southern Ohio, by W. L. Henninger, is the first specimen of this race taken in Ohio, though not the first recorded. This form has since been taken near Cleveland by O. E. Mueller (Aldrich, Auk, 53: 333-334, 1936). Of five nighthawks taken at random by Mr. Mueller in the fall of 1934, one was a male Sennett's (August 31, 1934); and of five birds taken in September 1935, one was a female of this same race (September 4, 1935). Thus, of ten birds taken near Cleveland, two, or twenty per cent, were *sennetti*. In reporting these records, Aldrich intimated that this race was probably much less frequent in migration in Ohio than this small sample would indicate. Subsequent work substantiates this conclusion. Several dozens of nighthawks handled by the writer from the autumn flights of 1935, 1936 and 1937 in various Ohio counties did not include a single individual that could be referred to *sennetti*, and few specimens even approached the characters of this race. Evidence to date indicates that *sennetti* probably composes less than one per cent of the annual fall migration of nighthawks through Ohio, although the three specimens taken in the State demonstrate that it may be a regular migrant.—LAWRENCE E. HICKS, Ohio State University, Columbus, Ohio.

Rediscovery of *Agyrtria luciae* (Lawrence).—One of the surprising acquisitions in a recent collection, obtained from C. F. Underwood, is a specimen from Catacamas, Olancho, eastern Honduras, taken on August 23, 1937. The author came to the conclusion that this was unquestionably the second known specimen of the exceedingly rare hummingbird, *Agyrtria luciae*. In order to make certain, it was forwarded to Mr. John T. Zimmer of the American Museum of Natural History, asking that it be compared with the type. A recent letter from Mr. Zimmer states: "I have made a comparison of your bird with the type of *Agyrtria luciae* and find excellent agreement. The type has the top of the head rather darker and duller than your bird and apparently lacks the fine pale tips on the upper tail coverts. It has a very slightly longer wing and tail and shorter bill but the differences are insignificant. The fresher condition of your bird makes its colors rather clearer but the pattern is identical. The rediscovery of this species is quite interesting and I am glad to have seen the specimen."

In the original description (Proc. Acad. Nat. Sci., Philadelphia, p. 233, 1867) no mention is made of the sex of the type specimen. However, in the genus *Agyrtria*, both sexes are similar and presumably they are in *luciae*. The recording of this second specimen removes this species from the doubtful class of possible hybrids.—ROBERT T. MOORE, California Institute of Technology, Pasadena, California.

Nesting of Salvin's Barbet.—It was my good fortune to observe two nests of Salvin's Barbet, *Eubucco bourcieri salvini* (Shelley) at El Volcan, Province de Chiriqui, Panama, in June and July, 1937. Since there appears to be no published record of the nesting of any of the New World barbets, it may be worth while to mention my own notes on the subject. Both nests were situated in woodpecker excavations in decaying fence posts. The holes were of a size suggesting the work of *Centurus*.

The first nest, at El Volcan, 4100 feet elevation, was in a fence-row at the edge of the jungle. The entrance hole was five feet from the ground, and 1.25 inches in diameter. It extended downward, increasing in diameter rapidly, with the floor of the chamber only seven inches below the entrance. The male was seen to enter this nest during the day, and I collected the female at night, so that the incubation appears to be shared by both sexes. There were two eggs, plain white in color. One contained an embryo of about five days development; the other was scarcely incubated. No developing eggs were found in the female's reproductive tract, so that the clutch was complete. The eggs were 16 x 25 mm. and 17 x 24 mm. Date: June 22. The female's iris was a deep reddish orange; bill pale greenish yellow, yellow at tip; legs and feet greenish slate, with yellow soles.

On June 26, I found a second nest, also at El Volcan, 4100 feet. On several occasions I had flushed a barbet from a certain bush along an old overgrown trail. Sometimes it was a male, at other times a female, and I concluded that a nest must be nearby. After searching for some time, I found it.

I have observed that tropical birds make less demonstration when intruders approach their nests than do birds in a temperate region. If I surprised the barbets near their nests, they gave no evidence of being disturbed by my presence, either by vocal outcry or by excess motor activity, injury-feigning, or other device for drawing my attention to them, and away from their nest. When I appeared, the barbets would quietly withdraw to another thicket, not approaching the nest until I had sat quietly but unconcealed several yards away for about half an hour. Then they resumed their activities as if I were not there at all.

The second nest was in a post of an old fence, surrounded by heavy undergrowth, and again next the jungle. The entrance was only two feet from the ground. There were newly hatched birds in this nest. On July 3, the fledglings were becoming noisy. Both parents brought food to them; so far as I saw this consisted only of insect fare. The youngsters did not discriminate between the arrival of the parent and my tapping on the stump—both phenomena were followed by loud squeaks from within the post. On July 7, the young still responded in the same way to my tapping, but by July 9, when they were at least thirteen days old, they kept perfectly silent during my visits, while still calling the incoming parents loudly.

The parents never went directly to the nest. Arriving with their beaks full of insects, they usually sat in a small bush about twenty feet away, seeking the inner twigs next the main trunk. Here they waited perfectly silent and motionless for five or ten minutes, appearing almost owl-like and ludicrous with their insect moustaches. Finally at no discernible stimulus, one would fly quite openly to the post and enter it at once. In a moment it would pop its head out, minus the insects; finding the coast clear, it would disappear into the hole once more, to be gone for some time. I assume that it dropped the insects at first, then returned to deliver them to the young. Eventually it would fly out, carrying droppings from the nest. Returning to the bush twenty feet away, it would relinquish the droppings, and then disappear into the forest. I could never follow the birds once they left the nesting site, for they moved only in the densest thickets, and then to some purpose; there was none of the constant nervous motion so common among passerine birds.

I finally collected this entire family on July 11. There were three young ones, about two-thirds fledged, and appearing very nearly equal in age. The young resembled the female parent in plumage.

Carriker states that Salvin's Barbet inhabits the highest jungle tree-tops in Costa Rica, but I never detected it anywhere in Panama except in dense thickets. Here it may easily be overlooked in consequence of its habit of perching quietly for long periods. It occasionally turns its head slowly from side to side, peering cautiously at the onlooker. It allows itself to be closely approached before flying away. I never heard an adult utter any note.—C. BROOKE WORTH, *Swarthmore College, Swarthmore, Pennsylvania*.

Arkansas Kingbird in South Carolina.—On November 19, 1937, during the occasion of the annual field trip of the A. O. U. meeting, an Arkansas Kingbird (*Tyrannus verticalis*) was seen by the majority of more than two hundred visitors. This constitutes the second known occurrence of the species in South Carolina, the former specimen having been secured on December 16, 1913 (Auk, 31: 248, 1914). Though this second instance is a sight record, the bird was seen by so many Fellows, Members and Associates of the A. O. U., that securing the bird was unnecessary. This was out of the question anyway, as the locality involved was Bull's Island, a part of the Cape Romain Federal Migratory Bird Refuge.

The bird was seen by the first arrivals on the Island, and it remained in the oak trees near headquarters for the rest of the day, where it was seen at frequent intervals by highly interested groups. It was one of four very rare species observed that day, which, in many ways, made ornithological history for South Carolina.—ALEXANDER SPRUNT, JR., *R. F. D. No. 1, Charleston, South Carolina*.

Arkansas Kingbird in Florida.—On April 2, 1938, I saw three Arkansas Kingbirds (*Tyrannus verticalis*) at close range in a bush at the edge of the southwestern shore of Lake Okeechobee, Florida. The birds were all tame and allowed themselves to be studied closely through an eight-power binocular. Their light gray upper parts, black eye-stripes, gray breasts, and yellow bellies were all clearly apparent. They did not act as if they had recently flown far, but behaved quite normally. But inasmuch as there had been recent hurricanes in the Mississippi Valley, it is possible that the birds had been blown out of their normal range.—C. BROOKE WORTH, *Swarthmore College, Swarthmore, Pennsylvania*.

Barn Swallow's nest without mud.—During field work on South Fox Islands in Lake Michigan on June 23, 1937, I entered a deserted dwelling in which were seven mud nests of the Barn Swallow (*Hirundo erythrogaster*) attached to the walls, and two House Wren nests in crannies. Three of the above swallows' nests contained eggs and during my inspection the birds flew in and out of the empty windows and through the house. A nest was found in a circular flue opening in the wall, seven feet from the floor. Because the makers could not be easily guessed, I waited a quarter of an hour for the return of the birds, but they did not come into the room so I took the nest and eggs away with me. Comparison of the eggs shows them to be beyond doubt those of a Barn Swallow. The nest, however, is unique in that no mud was used in its construction, for the floor and sides of the chimney flue offered ample support for a nest corresponding to the usual lining of a Barn Swallow's nest, albeit, better and more massively made. The main mass of the nest measured about seven inches across, with rootlets, grass and feathers continuing well beyond this limit. The cup was firmly woven, chiefly of fine rootlets, but with coarse rootlets and some grass on the outside. A few of the rootlets had small globules of sand adherent

to them, but these were apparently accidental inclusions, having been with the roots when gathered. The lining of the nest was composed of feathers, coarse toward the outside, downy adjacent to the eggs. The feathers were chiefly those of the Bald Eagle; one large secondary wing feather had been conspicuously shoved into the nest. Also identified was the breast feather of an adult Red-tailed Hawk. The five eggs were typical of the Barn Swallow. Nest and eggs were saved and are incorporated in the collection of the Cranbrook Institute of Science.—ROBERT T. HATT, *Cranbrook Institute of Science, Bloomfield Hills, Michigan.*

Raven's nest in Rockbridge County, Virginia.—Ravens (*Corvus corax principalis*) are still not uncommon in parts of the Virginia mountains, but few Virginia nests have been found in recent times. For many years I have had mountaineers searching in vain for nests. On April 17, 1938, my friend, Mr. J. H. Hostetter, finally located one, and on the following day I visited it with him. The nest was on a narrow ledge, twenty feet up in a steep eighty-foot cliff and under a large overhang on a mountain, which for obvious reasons I leave unnamed, in the western part of Rockbridge County. It was at an elevation of something over 3,000 feet. The nest was a large mass of sticks, loosely constructed on the outside but well built within and lined with grape and cedar bark and animal hairs. It contained but one young bird, about a week old. The adult, which we saw fly from the nest when we came within three hundred yards, only called once during our visit, but the young bird was very noisy.—J. J. MURRAY, *Lexington, Virginia.*

Southern Brown Creeper and Southern Winter Wren at Lexington, Virginia.—On December 20, 1937, I collected a Brown Creeper near Lexington, Virginia, which was later identified by Dr. H. C. Oberholser as *Certhia familiaris nigrescens* Burleigh, the recently described southern race (Proc. Biol. Soc. Washington, 48: 62, May 3, 1935; Mount Mitchell, North Carolina). This, I believe, is the first definite report of this race for the State of Virginia. The only specimens reported by Burleigh at the time of the description were a single one from West Virginia and twelve from North Carolina. Wetmore (Proc. U. S. Nat. Mus., 84: 418, 1937) has since reported another West Virginia specimen. The only evidence for the breeding of the Brown Creeper in Virginia is the fact that Dr. William C. Rives saw some of these birds near the summit of White Top Mountain in July, 1888 (Auk, 6: 50-53, 1889).

On the same day, December 20, 1937, and at the same place, I collected a Winter Wren, which Dr. Oberholser kindly identified and which turned out to be *Nannus hiemalis pullus* Burleigh. This is the first winter record of this southern race for Virginia.—J. J. MURRAY, *Lexington, Virginia.*

Mockingbirds in central western Illinois.—Previous to 1930, Mockingbirds (*Mimus polyglottos polyglottos*) were very irregular migrants in Adams County, Illinois, and in other central western Illinois counties. In 1933, five birds wintered at a feeding station in Quincy. Following a mild winter in 1936, there was a general northward drift of Mockingbirds. This extended as far north as Carthage, Hancock County, Illinois. This year, nearly every farm in Adams County had at least one nesting pair of "Mockers." This is the first time since bird records have been kept in this locality that Mockingbirds seem to have established themselves.—T. E. MUSSELMAN, *Quincy, Illinois.*

A second Willow Thrush in New Jersey.—"The Auk" has already published (vol. 52, p. 191, 1935) my record of our first *Hylocichla fuscescens salicicola*, a young female at Princeton, September 10, 1934. On August 12, 1936, I found another

fresh specimen killed against the same building (Guyot Hall, which houses the P. M. Z.). This was a male, with unossified skull and some juvenal wing feathers; scattered body feathers were still partly sheathed. Like the first specimen, this one is very small: wing (chord) 95 mm., one millimeter under Ridgway's minimum for *salicicola* males and 3.5 mm. below the minimum for males of *H. f. fuscescens* (see 'Birds of North and Middle America,' 4: 65, 68, 1907). In comparison with the 1934 skin, it is an even 'better' *salicicola* in the slightly darker, less bright-tawny shade of its upper parts, but the spots on the chest are not so dark; the flanks are lighter and grayer, less olive.—CHARLES H. ROGERS, *Princeton Museum of Zoology, Princeton, New Jersey.*

Nesting and re-mating of a pair of Bluebirds.—In the spring of 1934, at Washington's Birthplace, Virginia, as an experiment to determine the nesting territory of each pair of Bluebirds (*Sialia sialis sialis*) as well as to encourage their nesting nearby, I put up a number of nest boxes, made of hollowed sections of tree trunks, identical in size and shape. Seven boxes were placed at approximately 100-foot intervals on a rail fence along two sides of a horse paddock. Two others were put up near my residence about five hundred feet away, separated from the first group by a narrow strip of woodland.

A pair of Bluebirds occupied one of the first group of houses, completing their nest on May 12. Six eggs were laid on succeeding days from May 13 to 18, and all six were hatched on the morning of May 31. Two young left the nest on June 17, the remaining four on the 19th, all able to fly fairly well when they left the box. Both parents and young were banded. The same pair rebuilt the nest in this same box on July 1 and 2, and deposited four eggs on the dates of July 4, 5, 7 and 9, respectively. One egg hatched on the 20th, two more on the 21st and the last on the 22d. Two young disappeared from the nest on the 24th and a third on the 26th; reason unknown. The remaining one flew from the box on August 7. No other box in the first group was occupied that season. One house of the second group was occupied and four young were reared; no data available. Two of the young were banded but I was unable to capture the adults.

The same pair of banded adults returned to the same nest box in April 1935, and worked on the nest intermittently during the month. Six eggs were deposited on the following dates: April 28, 29, 30, May 1, 2, and 3, respectively. Three young hatched on May 16, two on the 17th and the sixth on the 18th. All left the nest on June 4. This pair rebuilt their nest June 15 to 18. Five eggs were deposited on succeeding days from June 19 to 23. The female was killed in nest box by a black snake on June 26 and the eggs were taken. One house of the second group was occupied again this same year. The male of this pair was already banded but I was unable to capture him to record the number. He was without a doubt one of the young reared in one or the other of these boxes the previous year. The female of this pair was banded during nesting activities. Eggs were deposited on May 3, 4, 5, 6 and 8. All five young hatched about May 22 and left the nest on June 7. This pair attempted to raise a second brood in July but something broke up the nest.

In the spring of 1936 the same male of the previous two seasons returned to his old nest box, having replaced his dead mate with the female that had nested in the box near my residence the previous season. They reared two broods again but I do not have any data on them as my records for this year were accidentally destroyed. Again, in 1936, all of the other boxes remained empty although there were numerous other Bluebirds seen nearby at various times during the nesting season.

From the foregoing it appears that the pairs of Bluebirds will not ordinarily nest within several hundred feet of each other unless possibly when the territory is broken up by woods or buildings. As to the re-mating of the same pair on succeeding years, I do not know whether this is unusual or not as I have been unable to find any other observations published on it. Throughout the nesting activity of the Bluebirds both of the adults appeared to share equally in nest building and feeding the young. The male also assisted in incubating the clutch, although the female appeared to do most of it. I was unable to make any time records of this phase. Since I was transferred to New Mexico in the fall of 1936 I was unable to carry my observations further.—HAROLD J. BRODRICK, *National Park Service, Carlsbad, New Mexico.*

Bluebird nesting in Cliff Swallow's nest.—Although there is a long list of novel containers chosen by Bluebirds (*Sialia sialis*) in which their nests have been built, I never knew of one to select a Cliff Swallow's nest until this summer. Five Cliff Swallows' nests were in use under the eaves of a small cottage at Round Lake (between Lake Placid and Keene, New York), along with two old nests that were in fair condition. In early July, I noticed two Bluebirds that were spending much time on the roof. Presently I saw that nesting material was being carried, and that the bird carrying it would first alight on the roof, then duck under the eaves into one of the old swallow nests. The nest within was constructed with great difficulty, for one of the Cliff Swallows (*Petrochelidon albifrons*) from an adjoining nest would attack the Bluebirds again and again, often forcing them to flee with the nesting material. The attacking continued well into the incubation period, though the Bluebirds were never molested when once within the flask-shaped structure of the nest. On July 23, the three eggs were hatched. About this time the Cliff Swallows using the same side of the building, had finished nesting and were no longer in evidence. The adult female Bluebird and the young were banded.—RALPH C. PRESTON, 21 Fairview Ave., Tuckahoe, New York.

Nesting of the Pepper-shrike.—Little has been written on the nesting habits of many tropical birds. Because of the interesting taxonomic position of the Pepper-shrikes, it seems desirable to report that the nesting is similar in many respects to that of the *Vireonidae* which they superficially resemble.

On July 3, 1937, I discovered a nest of *Cyclarhis flaviventris subflavescens* at El Volcan, Province de Chiriqui, Panama, at 4100 feet elevation. The nest was in a coffee grove in a large clearing in the jungle. It was built about seven feet from the ground in a fork next the main trunk near the top of a coffee tree. Two twigs diverging from the trunk at this point suspended the nest in typical vireo fashion. It was constructed largely of a type of moss that grows luxuriantly on the trunks and branches of the neighboring forest trees. Its texture was not as delicate as that of a true vireo, being more heavily and clumsily woven. Within the nest were two fledglings, about five days old. Their eyes were just opening, and their pin feathers were beginning to sprout everywhere. Strange to say, there was not a trace of natal down anywhere upon them, so that they must have been the epitome of nakedness at birth.

The parent birds made little demonstration at my presence, but flew up into a large forest tree which had been retained in the clearing to give shade to the coffee plants. From this vantage point they regarded me rather closely, but with little evidence of alarm. Occasionally one of them sang a short, low-pitched, melodious, vireo-like song, uttered with very little expression. Aside from this, and an occasional flirting of wings and tail, neither bird appeared to be nervous. At even this

distance the birds' characteristic markings were evident: chestnut crown, grayish-blue cheeks, olive upper parts, and grayish breast and belly washed laterally with yellow. Through a binocular I could see that both adults had red irides. The heavy bill, brownish black in color, was their least vireo-like character, giving the entire head a massive appearance.

During the following week I visited the nest several times. On one occasion a parent was brooding over the young when I arrived. It allowed me to stand directly under the nest and did not fly off until my extended hand jostled one of the twigs to which the nest was attached. It then, however, went at once to the large tree near the nest, where it hopped about with very little apparent concern.

The young developed rapidly, assuming the same plumage as their parents. They were fed entirely on insects, principally soft caterpillars, so far as I could see. Several times I noticed the parents arriving with food, only to retreat to the big tree when they saw me. Here they would wait for me to leave; but upon my staying, they would invariably swallow the caterpillars themselves and then leave to hunt for more. On July 10, I collected both parents, both young, and the nest, all of which now repose in the ornithological collection of the Academy of Natural Sciences of Philadelphia.—C. BROOKE WORTH, *Swarthmore College, Swarthmore, Pennsylvania*.

Loggerhead Shrikes and snakes.—On May 15, 1937, at Marco Island, Collier County, Florida, I was attracted to a group of fishermen watching some sort of a spectacle on the ground. Approaching the scene, I found a yellow chicken snake (*Elaphe quadrivittata quadrivittata*) being attacked by a Loggerhead Shrike (*Lanius l. ludovicianus*). The snake would crawl forward over the ground, and the shrike would fly down from a telegraph wire and, hovering over the snake, would pounce down, grasp the snake by the tail, rise in the air about six inches, and let the tail drop. The snake would immediately fall into a defensive coil and the shrike would alight on the ground about two feet away. It remained there until the snake once again wandered off; then it would hover, pounce, and grasp the snake's tail as before. Sitting along a telegraph wire close by, were four newly fledged young shrikes, which I had previously observed in a nest near at hand. A Mockingbird was also perched on the wire, but like the young shrikes took no part in the combat. Due to coming dusk, the shrikes moved off, and I threw the snake under an old building, to save it from the crowd that had gathered there.—EDWARD J. REIMANN, *Box 81, Everglades, Florida*.

An injured Starling.—While J. A. Neff and the writer were trapping Starlings (*Sturnus vulgaris*) in Washington, D. C., during February 1937, a Starling was noted that had lost almost the entire upper mandible. The appearance of the scar showed that the organ had been torn off rather than cut or broken. The terminal three-fourths of the lower mandible was exposed (Plate 18, lower figure). The crippled bird was with others of its species, and its physical condition, except for the missing mandible, was quite as good as that of any of its fellows. Apparently the handicap of having to feed with only the tongue and lower mandible had not seriously affected the bird's ability to procure food. The survival of a bird suffering from an injury of this kind well illustrates the hardihood and adaptability characteristic of the species.—CLARENCE F. SMITH, *U. S. Bureau of Biological Survey, Washington, D. C.*

Brewster's Warbler in the Chicago region.—Perhaps the chief contribution to Chicago-region ornithology during the summer season of 1937 was the breeding record of the Brewster's Warbler (*Vermivora leucobronchialis*). The discovery of this hybrid provided a most interesting climax to an unusual list of resident warblers

found in the private tracts of oak and hard-maple woods bordering the Desplaines River on the northwest side of Chicago (Deerfield Township, Cook County). In addition to the generally distributed Yellow Warbler (*Dendroica a. aestiva*), Oven-bird (*Seiurus aurocapillus*), Northern Yellow-throat (*Geothlypis trichas brachidactyla*), and Redstart (*Setophaga ruticilla*) that were present, the more or less rare and locally distributed Cerulean Warbler (*Dendroica cerulea*) and Yellow-breasted Chat (*Icteria v. virens*) were also found in the very same tract. On June 13, Mrs. H. D. Smith of Lake Forest and Mr. Rudyerd Boulton of the Field Museum observed males of the Blue-winged (*Vermivora pinus*) and Golden-winged (*Vermivora chrysoptera*) Warblers in full song. The rarity of the latter as a summer resident and the proximity of their respective territories prompted C. T. Clark and the writer to visit the locality on June 27. At this time the Golden-winged Warbler was not located, since it probably had completed nesting if it were breeding; but the Blue-winged Warbler was found with a female Brewster's Warbler, attending one juvenile bird. The male, a typical *pinus*, was heard singing several times, not the usual inhale-exhale song, but a version that could be interpreted as *zee-zee-zee-zee-zwee*, the last note prolonged and decidedly ascending. Only the Brewster's Warbler was observed carrying food in its bill and once actually feeding the young bird. A small white caterpillar seemed to be the favorite food; this the warbler would bring to a branch, knock it about and against the branch, and then carry it on. The movements of the adults, particularly the food-carrying of the hybrid female, evidenced that other offspring were present in the vicinity, but we were unable to locate more than the one. In this, however, we considered ourselves fortunate in view of its well-grown condition and ability to fly about; nevertheless our view was disappointing because the young bird was so perched on a thick branch that only its tailless posterior and its blue-gray wings could be seen. At that moment the Brewster's Warbler came and fed her offspring; immediately afterward the pair moved on to another shrub. Later, when through a movement of this juvenile, we happened to be close to it, the Brewster's Warbler came down nearer the ground, and with fluttering wings and jerks of its tail, it appeared to feign injury for a short while. We were never able to observe satisfactorily the color of the head and under parts of the juvenile.

In spite of the high activity that surrounded us every few minutes that this pair of warblers passed in making the apparent rounds of food supply and offspring, our position in what might be termed the 'traffic center' permitted us with the aid of our eight-power glasses to obtain excellent, close-range views of the hybrid in the best of light and in a variety of positions. The description of the Brewster's Warbler as made in the field follows: crown and breast yellow; sides of head gray; throat lighter than breast, appearing dull white washed lightly with yellow; black line through eye as in typical *pinus*; wings and back plain gray, *wings without any marks*; outer tail feathers with white as in typical *pinus*; no indication of black head markings of *chrysoptera*. The departures from typical *leucobronchialis* in this particular hybrid's plumage were: the more extensive distribution of yellow of the breast and the apparent absence of any wing-bars or patch on the plain-gray wings. The latter, we realized, was unusual to the extent that it might raise some question, and at the time a special effort was made to study the wings as well as possible, after which the conclusion that they were just plain gray was reached. The writer has since been unable to find mention of any specimens of either *pinus*, *chrysoptera*, or the hybrids, which lacked wing-markings.

On July 4, the writer returned to the locality. The male Blue-winged Warbler was found singing in the very same pattern as described above and in the very same

territory; however, the Brewster's Warbler was not seen again. Curiously enough (at this date) another Blue-winged Warbler was discovered a short distance to the south, singing the usual inhale-exhale song. Between these two warblers lay a swampy stretch cut by a brook—the territory in which the Golden-winged Warbler was observed previously. While the writer stood at the edge of this brook, a small bird which proved to be a warbler was sighted at the top of a small elm. Though seen at a distance of from 100 to 125 feet, this warbler was at the top of the elm and in good light, and remained there a few moments, during which we noted that it was a Brewster's Warbler resembling *chrysoptera* more closely than *pinus*. Its dissimilarities from the former were: the presence of one conspicuous white wing-bar and a distinct black line through the eye. No throat patch nor yellow could be seen on the breast, which was dull white throughout. Whether or not this could have been a fully grown offspring of the pair observed previously or even a young of the Golden-winged Warbler remains a puzzle.

In the Chicago region, the Blue-winged Warbler is a rare summer resident of which there are fairly recent breeding records; it is reported most frequently from the Indiana Dunes, where it should be considered uncommon rather than rare. The Golden-winged Warbler has not been recorded as a summer resident for more than forty years. Of the Brewster's Warbler, there are a few published and a number of unpublished, reliable records. The writer is aware of only one record of the Lawrence's Warbler (*Vermivora lawrencei*)—that listed in Ford, Sanborn and Coursen's 'Birds of the Chicago region' under date of May 15, 1931, an observation which, though not so stated, should be credited to C. T. Clark, who contributed the record.

The discovery of the breeding of Brewster's Warbler constitutes the first record for the Chicago region and also a westward extension of its breeding range as based on Maurice Broun's statement in Forbush's 'Birds of Massachusetts,' which lists Michigan as the farthest point west; however, the latter is relatively unimportant in that Brewster's Warbler can be expected even more to the west where the breeding areas of *V. chrysoptera* and *V. pinus* overlap.—FRANK A. PITELKA, Lyons, Illinois.

Chestnut-sided Warbler nesting near Baltimore, Maryland.—On June 16, 1937, while walking along the Green Spring Branch of the Pennsylvania Railroad, at Lake Roland, half a mile north of the Baltimore city limits, I noted a pair of Chestnut-sided Warblers (*Dendroica pensylvanica*) flitting about a low tract of underbrush in pursuit of insects. The location is that where F. C. Kirkwood found several pairs of Blue-winged Warblers (*Vermivora pinus*) breeding many years ago. The flora of the habitat is chiefly upland sumac (*Rhus glabra*) and blackberry. After I had watched the movements of the warblers for about ten minutes, the pair separated; the female, which could be readily distinguished from the male by its gray crown and less brilliant coloring, disappeared among the underbrush, while the male flew to a grove of white oaks (*Quercus alba*) on the side of a nearby hill. Here it remained and sang at short intervals, and as it displayed no apparent desire to depart from the vicinity in which it was originally sighted, I set about to locate the female. As I sat overlooking the habitat, deeming it possible that the female might be picked up in its movements among the underbrush, it suddenly appeared, spanned the tips of the upland sumac for about fifteen feet, and disappeared into a clump of blackberry bushes. An investigation after a wait of five minutes revealed the female busily adding material to a partially constructed nest. The nest was slung between two blackberry stalks and was approximately three feet from the ground. I immediately left the vicinity.

A subsequent visit to the nest was made on June 26. Upon entering the blackberry patch, the female flushed at five feet and revealed a completed nest with one egg of a Cowbird (*Molothrus ater ater*) and two of her own. The nest had become almost entirely detached from one of the stalks, and was slanted at about a fifty-degree angle. This condition was probably to be attributed to the Cowbird's encroachment. When I disappeared from the scene, having left a camera and tripod in my stead, the female warbler slowly worked back to the vicinity of the nest. Its highly excited *chip-chip* notes, resembling those of the Redstart (*Setophaga ruticilla*), changed to a somewhat fainter *cheep-cheep*; and although it did not actually settle upon the eggs until a half hour after my departure, it would often stop as it flitted by, stand on the rim of the nest, turn the eggs over several times and then dart into the underbrush. Not long after the female settled down to incubate, I released the camera's shutter from my improvised blind, twenty feet away, and the sitting bird immediately flushed. In less than five minutes she had returned to incubate. A second 'snap' of the shutter failed to disturb her. The male warbler was neither heard nor seen during the second visit. Upon an investigation two weeks later, the nest had become completely severed from its support and the contents lay broken on the ground.—M. BROOKE MEANLEY, JR., *Univ. of Maryland, College Park, Maryland.*

Mourning Warbler nesting in Wisconsin.—In the January, 1934, issue of 'The Auk' I mentioned the finding of the nest of the Mourning Warbler (*Oporornis philadelphia*) near Germantown, Washington County, Wisconsin. Upon that occasion we found only one nest and saw but one pair of birds in the locality. Inasmuch as this was the first published record of the finding of a nest in Wisconsin, we considered the bird a rare nester in the State although Dr. Schorger reported having seen adults feeding large young at Lake Owen. On June 25, 1937, Mr. Warren Dettmann and I visited the Germantown area in the hope of finding another nest. Not far from where we found the breeding pair several years ago, we located a partially completed nest by watching the actions of a pair of adults. Upon further investigation of nearby open places in the heavy brush where jewel-weed and nettle grew, we saw a dozen or more males and two females and heard a number of singing males. Two pairs were observed to be feeding fully fledged young. We climbed trees in order to have a better view of the jewel-weed patches below, and learned that the adults do not fly directly to the young to feed them but alight at a point from twenty-five to fifty feet away and take a ground route. Their movements below were detected by the vibration of the tops of the jewel-weed. By noting the focal point of these movements, one may locate either the nest or the young. While trying to locate one of the young, several of us stood quietly and the adult female hopped along the ground within a few feet of us, apparently unafraid. In this locality this species seems to be partial to an undergrowth of jewel-weed and nettle. We visited several nearby wood patches which contained neither jewel-weed nor nettle, and could locate no more of the birds.

In a recent letter, Mr. C. H. Richter, of Oconto, reports that the Mourning Warbler is a fairly common summer resident along the Oconto River bottoms and on the small willow- and nettle-covered islands, but that he has not located a nest.

Mr. Clarence Jung of Milwaukee reports that on July 18, 1937, he observed a pair of Mourning Warblers feeding two fully fledged young in a nettle patch in a large woods a short distance west of Cedar Grove in Sheboygan County, Wisconsin.

In view of the foregoing facts it would seem that this species is not as rare a breeder

as was formerly supposed. However, with the exception of Dr. Schorger's observations at Lake Owen, all present breeding records are confined to the lake-shore counties.—O. J. GROMME, *Milwaukee Public Museum, Milwaukee, Wisconsin.*

West Indian orioles of the genus *Icterus*.—In his recent revision of the *Icteridae* ('Cat. Birds of the Americas,' vol. 10), Dr. Hellmayr has arranged the West Indian orioles under five species: *Icterus dominicensis* of Hispaniola, with races in Cuba and Puerto Rico; *I. laudabilis* of St. Lucia, with a race on Montserrat; *I. leucopteryx* of Jamaica, with races on Grand Cayman and St. Andrew's islands. *I. northropi* of the Bahamas is considered conspecific with *I. mesomelas* of Central America, while *I. bonana* of Martinique is placed next to the Orchard Oriole (*I. spurius*). With the exception of *I. leucopteryx*, a very distinct species, I consider this grouping most misleading. In the first place, the nearest relative of *I. laudabilis* is undoubtedly the erythristic *I. bonana*, which bears no close relationship to *I. spurius*. Secondly, *I. northropi* has, in all probability, been derived directly from Cuba, as is the case with most of the Bahaman land birds. Those who wish to use the 'formenkreis' should treat West Indian orioles as two species, *I. leucopteryx* and *I. bonana*. This at least would be a more natural arrangement!—JAMES BOND, *Academy of Natural Sciences, Philadelphia, Pennsylvania.*

The Western Meadowlark in Ohio.—The Western Meadowlark (*Sturnella neglecta*) was unknown in Ohio until 1930, save for one accidental straggler, a male, collected by S. Hall, near Lakewood (Cleveland), Ohio, on April 8, 1880. This is now in the collection of the California Institute of Technology, Pasadena, California (J. Stevenson, Auk, 48: 431, 1931).

A second specimen for Ohio was taken by the writer on May 22, 1937, along Swan Creek, three and a half miles west of Maumee, Lucas County, Ohio. This bird, a male, sang freely, and, when flushed, repeatedly returned to a favorite singing perch on a roadside telephone pole. No female was observed. This specimen is now No. 7507 in the Ohio State Museum collection. Through correspondence with Louis W. Campbell, of Toledo, it was later learned that a male (presumably the same one collected by me) had been seen on four occasions during May 1937. It was observed (while in full song) one mile east of Holland, Lucas County, on May 8, 1937, by Mr. and Mrs. Bernard R. Campbell, and on May 9, 1937, by Bernard R. Campbell and Louis W. Campbell. A week later it had moved its territory three miles to the southwest (near the place where collected). It was seen at the new locality by Bernard R. Campbell on May 15, and by Louis W. Campbell on May 21.

One sight record of the Western Meadowlark in Ohio has been published: a singing bird observed on March 17, 1932, by E. L. Wickliff and Milton B. Trautman in central Grand Rapids Township, Wood County (Auk, 50: 235-236, 1933). I know of no other records except those listed below.

The writer found this species as a rare and local summer resident in Wood, Henry, Fulton, Lucas, and Defiance Counties in 1930 and 1931 and concluded that it was probably a recent invader from the West. Most of the birds were obviously males, singing the typical song of the western species with great gusto and persistence. Three individuals seemed to have no definite territories, but most of the males recorded had well-defined territorial limits. The majority were obviously non-breeding birds (without mates). In two instances, however, males of typical "western" song consorted with females presumed to represent the same species. In one of the latter cases, adults were observed to carry food to nestlings. This seemed to constitute acceptable breeding evidence.

I have the following sight records for Ohio. Wood County: June 21, 1930, one singing bird in northern Liberty Township (this bird and another were later observed carrying food to nestlings); March 15, 1931, one individual singing, three miles west of Bowling Green; and September 6, 1936, a single bird in northern Henry Township. Lucas County: May 17, 1930, one singing bird observed near Swanton by Robert McCormick and the writer. Henry County: June 22, 1930, one singing bird and a silent companion in northeastern Washington Township; and July 28, 1937, a singing bird two miles north of Napoleon. Defiance County: June 28, 1930, a singing bird without a mate in northeastern Adams Township. Fulton County: June 24, 1930, two singing birds near Wauseon; June 26, 1930, one individual (singing) along Ten Mile Creek southwest of Metamora; July 30, 1930, one along Swan Creek northeast of Swanton; and June 21, 1937, one singing bird on territory near Delta. Logan County: June 18, 1937, two miles north of Indian Lake. This bird was without territory, singing within two hours from various stations along two miles of roadside. Muskingum County: on August 8, 1935, north of Roseville, Woodrow Goodpaster and the writer observed a single bird for more than two hours. This individual contrasted strikingly with a dozen Eastern Meadowlarks of the same flock. It seemed to be highly excited, shuttling between the tops of various clumps of willows, while emitting a great variety of call notes and weak attempts at song. Some of the call notes could not be distinguished from those of its companions. This bird remained in the vicinity for at least ten days.

SUMMARY: The Western Meadowlark has now been recorded from eight counties of Ohio. Two specimens have been taken. At least twenty-six records (representing about eighteen different individuals) have been made by nine observers. Some were obviously of stragglers or migrants. Most of the records, however, were of summer residents in sandy areas of five northwestern Ohio counties. The majority were non-breeding individuals, but evidence that some bred has been obtained. It is probably accurate to consider this bird as a recent invader from the West. Even in northwestern Ohio, the Western Meadowlark is still so rare that a good observer will average less than one record in a thousand miles of field work by automobile travel.—LAWRENCE E. HICKS, *Ohio State University, Columbus, Ohio.*

Second record of Brewer's Blackbird in Alabama.—Since Brewer's Blackbird (*Euphagus cyanocephalus*) was first recorded in Alabama, near Foley, on March 23, 1936 (Auk, 53: 452, 1936), apparently no one has again noted it in the State. It is therefore of interest to record a flock of approximately a hundred of these birds feeding about cows in a pasture ten miles south of Montgomery, on November 30, 1937. In an adjoining cornfield there was a large concentration of other blackbirds but, as characteristic of the Brewer's Blackbird in the Southeast, the birds showed no inclination to associate with their near relatives, and during the brief time they were watched, they remained consistently apart. Both sexes were present in practically equal numbers, and the birds were feeding in small scattered groups rather than in a compact flock. Two, a male and a female, were collected to verify their occurrence in Alabama on this date, and are now in the Biological Survey collection in Washington.—THOMAS D. BURLEIGH, *U. S. Bureau of Biological Survey, Gulfport, Mississippi.*

Red-wing parasitized by the Cowbird.—On July 1, 1937, I came across an abandoned nest of the Red-wing (*Agelaius phoeniceus*) of usual type in cat-tails some ten feet from the shore of a small lake (Nancy Lake) about thirty miles north of Toronto; the nest contained two eggs of the Cowbird (*Molothrus ater*) and none of the Red-wing. The shore at this spot was covered by a swampy growth of alders.

This is the only case I have knowledge of in some seventeen years of study locally, there appear to be no other records for Ontario.—R. D. USSHER, *Nancy Lake Farm; King, Ontario.*

Hosts of the Cowbird, *Molothrus ater obscurus*.—The recent article by Friedmann (Auk, 55: 41–50, 1938) on the hosts of the parasitic cowbirds prompts me to contribute the following data on this highly interesting phenomenon. During the spring and early summer of 1930, I made an intensive survey of the nesting birds in the vicinity of Oroville, Butte County, California. I was afield practically every day from the beginning of the nesting season in January until its wane in mid-June. During this time I located only five nests parasitized by cowbirds, as follows: Western Gnatcatcher (*Poliophtila caerulea amoenissima*), three; Western Lark Sparrow (*Chondestes grammacus strigatus*), one; and Western Trail's Flycatcher (*Empidonax traillii brewsteri*), one.

The interesting part of my findings, to me at least, is the difference in the incidence of parasitism observed in the Western Gnatcatcher and the Western Lark Sparrow, both of which were common breeding birds in the area. Of six nests of the former three (50 per cent) contained eggs of the cowbird. One set, collected May 8, consisted of five eggs of the host and one of the parasite; the second, collected May 23, held one of the parasite and three of the host, as did the third set, collected May 26. On the other hand, only one of the ten nests of the Western Lark Sparrow was parasitized. The set consisted of four eggs of the host and one of the parasite. One is led to wonder if the Western Gnatcatcher is not handicapped by its small size in this struggle. Certainly, its nest is less conspicuous than that of the Western Lark Sparrow, at least to man. The nest of the flycatcher, located May 27, contained two eggs of the host and one of the parasite. On the ground below the nest were two broken eggs of the host, a circumstance suggesting that the cowbird removed them from the nest in order to make room for her own.

I should like to point out here that the cowbird in the vicinity of Oroville appears to be *obscurus* (see Condor, 39: 227–228, 1937) rather than *artemesiae* as Friedmann (*loc. cit.*, p. 48) states. This circumstance necessitates transferring *Agelaius p. californicus* from the host-list of *artemesiae* to that of *obscurus*.—WILLIAM B. DAVIS, *Tezas Agricultural and Mechanical College, College Station, Texas.*

Nelson's Sparrow in eastern New York.—It was my fortunate experience to view on October 14, 1937, two Nelson's Sparrows (*Ammospiza caudacuta nelsoni*) along the banks of the Mohawk River, a few miles east of the city of Schenectady, New York. As I wandered along the river bank during the course of one of my daily excursions, my attention was attracted to a small cinnamon-buff sparrow, feeding along a marshy section of the shore line. After observing the bird during the course of its quick movements, I flushed it into a small cluster of cat-tails nearby. During its flight the opportunity for a further view of its identifying marks became available. It was approximately eight feet from me when it landed; then it became rather inquisitive, returning to view each time that I emitted an occasional squeak. I knelt down, making a few notes relative to the sparrow and as I did so, the bird went to the top of the cat-tails, apparently in order to secure a better view. The cinnamon buff of breast and sides, along with the stripes above the eyes, and the slightly obscure stripes on the breast and sides were easily visible. The back was mostly gray with some white stripes. The abdomen was grayish and the under tail-coverts were buff; the upper mandible was a dark reddish and the lower one yellowish.

Upon the completion of my observation I left the bird, and moved slowly along the

shore line, seeking additional ones. However, I did not find any in the direction that I followed. Retracing my steps to the first point of contact, I found the original Nelson's Sparrow and another one identical with it. Further observation firmly established the identity of both of these sparrows; flushing them eventually, they flew down the river in erratic flight. Clarence Houghton, of Albany, New York, a distinguished authority in this part of the State, has recorded the only other appearance of the Nelson's Sparrow in this part of New York. His record discloses that on August 28, 1920, nearly eighteen years ago, at Lake Cassayuna, approximately sixty miles from here, he established the first Nelson's Sparrow record. Investigation leads me to the thought that possibly some of these birds use the Mohawk Valley of New York State as a channel of migration for their annual flight from the Mississippi Valley to the Atlantic coast each fall.—JOSEPH JANIEC, 663 Crane St., Schenectady, New York.

Eastern Snow Bunting in South Carolina in summer.—Late in the afternoon of June 21, 1937, my wife and I were watching a colony of Wilson's Plovers (*Pagolla wilsonia wilsonia*) on the eastern end of Sullivan's Island, when our attention was attracted by a small black and white bird which I recognized as a fine male Snow Bunting (*Plectrophenax nivalis nivalis*). We observed it for several minutes at close range until it made a long flight into the Fort Moultrie rifle-range reservation. The next morning, Messrs. E. Milby Burton and E. Burnham Chamberlain, of the Charleston Museum, and I hunted unsuccessfully for it; but on June 24, Mrs. E. H. McIver notified the Museum that the bird had been in the backyard of her Sullivan's Island cottage for several days and that she was feeding it. On the morning of June 25, Messrs. Chamberlain, G. Robert Lunz, E. B. Chamberlain, Jr., and I observed the bird for an hour in Mrs. McIver's yard. Mr. Lunz took a dozen photographs and I made several pencil sketches. The bird sang frequently from its favorite perch on an electric wire. We agreed that the song reminded us somewhat of that of the Nonpareil (*Passerina ciris*). Mrs. McIver's house is nearly a mile from the spot where the bunting was first seen; later it disappeared and has not been reported again.—E. VON S. DINGLE, Mount Pleasant, South Carolina.

A modern bird fatality.—While in La Mesa, California, June 1937, with Mr. Archbold, preparing for our 1938 New Guinea Expedition, a curious bird fatality in connection with the experimental radio was called to my attention. I was not there at the time and am indebted to Mr. Harold G. Ramm, the radio operator, for the following details. A bird, apparently a Mockingbird from the description, alit on the single insulated wire of the transmitting antenna. When the power was turned on the bird dropped dead, killed by the high radio frequency. The antenna was carrying 500 watts with a radio frequency of 7000 kilocycles at the time. The bird alighted on or near a current node where the current was lowest and the voltage highest, the only place dangerous for it.

A number of men working about powerful broadcasting stations have been reported killed by radio frequency but this is the first instance of a bird's death in such a manner which has come to my attention. It is unlikely that this new hazard to bird life is of great enough extent to be important, but it is possible for birds alighting on the transmitting antenna of any radio station to be killed.—A. L. RAND, American Museum of Natural History, New York City.

Deaths from electricity have been reported from time to time. Mr. J. Warren Jacobs sends a clipping from the 'Morning Observer,' Washington, Pennsylvania, of October 29, 1937, concerning a Great Blue Heron (*Ardea herodias*) which had

flown into a 22,000-volt high-tension line supplying power to the Nemaquin Mine, in Greene County, Pennsylvania. The short circuit resulted in blowing out the transformer and throwing one thousand miners out of work for the day. The facts are vouched for by Mr. Jacobs. An item in the 'Boston Sunday Herald' of November 28, 1937, reports the death within a week of a number of 'American Eagles' through alighting on power poles near St. Anthony, Idaho. These reports, if trustworthy, indicate a new menace for large hawks and eagles, that might perhaps be overcome by proper insulating devices.—Ed.]

Milk snakes vs. birds.—That snakes are notorious bird eaters is well known. It is also rather strange what extraordinary places they ascend, and their manner of obtaining knowledge that a nest exists in these places. In rose bushes and low shrubs where Chipping Sparrows (*Spizella p. passerina*) nest, it might not be so unusual, and surely not with ground-nesting species. At my nextdoor neighbor's house, on the east side, a rambler rose climbs a trellis up some twenty feet, and stands fully twelve inches away from the building. Here, about six feet up, a Chipping Sparrow had her nest; and she was heard and seen feigning wing injury three times before we realized the snake's presence. This milk adder lived under the porch piazza. On our visits to the nest the snake would drop directly to the ground and flee. It would climb, as we saw later, directly up the clapboards of the house, in a wide spiral way, then reach over into the rambler at its nearest branch. In the end it had to be shot, using craft to get it.

In a large stone cattle pass under the railroad, a spot infrequently visited, Phoebe (*Sayornis phoebe*) have nested for years. The young or eggs have sometimes mysteriously disappeared. The pass is built six feet high, the walls of large stone blocks, sloping on an inward incline from halfway up, to the top, where the tops of the stones extend back about six inches, forming a shelf. On this the Phoebe nest. I would make my visits after dark, to catch the adult bird and band her. For three years I happened to pick the same night a milk snake did. Each one was killed. But the marvel is that the snake could locate the nest, and, after discovering it, climb up the outward slant of the rock to the nest, thence lie along the shelf and eat the young at its leisure. There was no other access, as the top is solid. And each time the female Phoebe would be quietly perched on the pasture fence just outside one end of the culvert, to fly only at our approach.—LEWIS O. SHELLEY, *East Westmoreland, New Hampshire*.

Noteworthy records for Nova Scotia.—During the last ten years or so, several interesting occurrences of accidental or locally rare birds for this province have come to my attention. I am indebted to Mr. Robie W. Tufts, of Wolfville, Nova Scotia, for his information on several of the following records.

MAN-O'-WAR-BIRD, *Fregata magnificens*.—An adult female was shot at Pennant Bay, Halifax County, on December 5, 1932, by George Little. This is the third known record of this species for Nova Scotia.

BLACK-CROWNED NIGHT HERON, *Nycticorax nycticorax hoactli*.—An adult male was found dead in an emaciated condition near Port Williams, Kings County, on April 30, 1926. On April 1, 1928, one was picked up dead in Yarmouth County.

YELLOW-CROWNED NIGHT HERON, *Nyctanassa violacea violacea*.—An immature of this species was collected by Earl Godfrey at North Grand Pré, Kings County, on September 13, 1932. Mr. Godfrey also collected one in juvenal plumage on July 28, 1937, and two more in juvenal plumage on August 12, 1937.

LEAST BITTERN, *Izobrychus exilis exilis*.—One was killed at Little Hope Light, Queens County, on September 1, 1935.

GREATER SNOW GOOSE, *Chen hyperborea atlantica*.—One was shot at Lower Wedgeport, Yarmouth County, by Israel Pothier of that place on March 11, 1932. Another was seen on the same day at the same locality. The specimen that was killed was a fine adult bird. I received the skin of it and mounted it for the Provincial Museum at Halifax.

GADWALL, *Chaulelasmus streperus*.—One was shot near Wolfville, Kings County, on November 14, 1931.

VIRGINIA RAIL, *Rallus limicola limicola*.—I collected a female of this species on October 27, 1937, at Wolfville.

YELLOW RAIL, *Coturnicops noveboracensis*.—On May 12, 1929, one was picked up dead at Meadowville, Pictou County, by Mrs. G. W. Murray and sent to Robie W. Tufts of Wolfville, Nova Scotia, for identification. This specimen is now in the Provincial Museum. One was collected near Wolfville by Earl Godfrey on October 9, 1933.

PURPLE GALLINULE, *Ionornis martinica*.—About the first of May, 1927, one was found dead near Canard, Kings County.

RUFF, *Philomachus pugnax*.—On October 1, 1928, one was collected near the Cornwallis River at New Minas, Kings County, by the late V. E. Gould of Wolfville, Nova Scotia. It was feeding in a brackish pool with a lone Greater Yellow-legs when shot. This specimen was a ruffless bird of indeterminate sex. Dr. H. C. Oberholser of the Biological Survey, Washington, D. C., verified the identification of this specimen. It is now in the Provincial Museum at Halifax.

RED-HEADED WOODPECKER, *Melanerpes erythrocephalus*.—An immature specimen was collected at Windsor, Hants County, on December 3, 1928.

ARKANSAS KINGBIRD, *Tyrannus verticalis*.—One was killed by a cat at Lower Wedgeport, Yarmouth County, on October 26, 1935. This specimen is now in the Provincial Museum at Halifax.

CRESTED FLYCATCHER, *Myiarchus crinitus boreus*.—An adult male, with enlarged testes, was collected for me by a friend at New Minas, Kings County, on May 30, 1931. This bird had been seen for several days and during that time had been very active in bullying Yellow Warblers and Chipping Sparrows.

HOUSE WREN, *Troglodytes aëdon*.—One came to the premises of Mr. John W. Piggott, Bridgetown, Annapolis County, on July 2, 1932. This bird remained about his nesting boxes for two days and then disappeared. On June 4, 1933, I collected an adult male at my home in Wolfville. This wren was first seen on June 2, and during the two days following, spent most of its time carrying small twigs into nesting boxes. An adult male was taken by Cyril Coldwell on July 6, 1935, at Gaspereaux, Kings County. Again on November 7, 1936, another House Wren was collected at Gaspereaux by Mr. Coldwell.

SUMMER TANAGER, *Piranga rubra*.—An adult male was found at Annapolis Royal, Annapolis County, in an emaciated and injured condition, on October 10, 1929. It was kept in captivity until October 23, 1929, when it was liberated. A few days later it was picked up dead.

INDIGO BUNTING, *Passerina cyanea*.—On April 17, 1934, one was found dead near Halifax. One was picked up dead at East River Point, Lunenburg County, on April 18, 1934. Another specimen was also found dead, by Mr. J. W. Willis, at Port Mouton, Queens County, on April 28, 1934.

DICKCISSEL, *Spiza americana*.—A specimen of this species was killed at North

Sydney on December 3, 1929. It had been feeding with some English Sparrows in the center of a road and was hit by a passing car as it flew. This specimen is now in the Provincial Museum at Halifax.

IPSWICH SPARROW, *Passerculus princeps*.—Earl Godfrey of Wolfville, collected one on February 2, 1929, and another on November 28, 1936. Both of these specimens were taken near Wolfville, Kings County.

WHITE-CROWNED SPARROW, *Zonotrichia leucophrys*.—May 15, 1933, one was seen by Robie W. Tufts on his premises at Wolfville. May 16, 1933, one was shot at Bridgetown, Annapolis County, by John W. Piggott. Another specimen was killed at Windsor, Hants County, on May 16, 1934. On October 14, 1934, Dr. Harrison F. Lewis saw one at the Chebogue River, Yarmouth County.—RONALD W. SMITH, *Wolfville, Nova Scotia*.

Observations at Muscongus Bay, Maine.—During the last two summers at the Audubon Nature Camp on Muscongus Bay, Maine, the writer has had the unusual opportunity of putting in six full months of intensive daily field observations. During this period, 175 species of birds have been recorded; some of these observations are of sufficient significance to be put on record. Of even greater interest, however, than unusual species and birds out of season is the noted increase in the numbers of nesting seabirds. In 1931, R. P. Allen and A. H. Norton, surveying the entire Maine coast, were delighted to discover Great Black-backed Gulls (*Larus marinus*) breeding as far south as Northern White Island off Pemaquid Point. They were just as pleased to find four pairs of Double-crested Cormorants (*Phalacrocorax auritus auritus*) nesting as far south as Muscongus Bay. In 1937, there were 93 pairs of Great Black-backed Gulls and 721 pairs of Double-crested Cormorants nesting in Muscongus Bay alone, a truly remarkable increase.

LEACH'S PETREL, *Oceanodroma leucorhoa leucorhoa*.—Occasionally seen flying in the bay after storms. As far as we are able to determine, the nearest breeding colony is on Little Green Island at the mouth of Penobscot Bay.

WILSON'S PETREL, *Oceanites oceanicus*.—None was observed during 1936. After stormy weather in late June 1937, a few of these birds appeared in the bay and were seen on most of our boat trips for the next two weeks.

EUROPEAN CORMORANT, *Phalacrocorax carbo carbo*.—As many as five were seen on June 17, 1936, by R. T. Peterson. Two of these birds remained for the entire summer and were seen on numerous occasions. One adult and two young of this species passed the summer of 1937 in Muscongus Bay. At present we have no reason to believe that this species has established itself as a breeding bird.

LITTLE BLUE HERON, *Florida caerulea caerulea*.—One adult was seen along the banks of the Medomak River by Joseph Cadbury and his class on August 22, 1937.

YELLOW-CROWNED NIGHT HERON, *Nyctanassa violacea*.—A beautiful adult was seen by the entire camp along the Medomak River on July 25, 1937.

AMERICAN BRANT, *Branta bernicla hrota*.—A single bird flew over Hog Island on June 13, 1937.

AMERICAN EIDER, *Somateria mollissima dresseri*.—We have not found this species nesting farther south than Penobscot Bay, but it is a common bird in Muscongus Bay all summer. Flocks of over one hundred birds are by no means unusual.

PIPING PLOVER, *Charadrius melodus*.—A single individual was observed by R. T. Peterson on Muscongus Island, August 24, 1936.

WILLET, *Catoptrophorus semipalmatus* (subsp.?).—A single bird was carefully studied on July 30, 1937. Possibly the same bird was heard flying over Hog Island on the evening of July 28 by Alexander Sprunt, Jr.

PURPLE SANDPIPER, *Arquatella maritima*.—It was a surprise to find this bird fairly regular in late summer on the outlying rocks. The records are as follows: August 21, 1936, Little Green Island, one; September 4, 1936, Old Hump Ledge, twelve; August 16, 1937, Little Green Island, one; August 25, 1937, Little Egg Rock, two; August 28, 1937, Monhegan Island, three; August 30, 1937, Monhegan Island, one.

STILT SANDPIPER, *Micropalama himantopus*.—Two birds were seen with a Greater Yellow-legs (*Totanus melanoleucus*) July 28, 1937.

RED PHALAROPE, *Phalaropus fulicarius*.—None was seen in 1936. A definite flight came in on August 3, 1937, when over five hundred birds were observed, some still in partial breeding plumage. From that date until early September scattered flocks of this species were encountered.

NORTHERN PHALAROPE, *Lobipes lobatus*.—Only four Northern Phalaropes were seen in 1936. On August 3, 1937, approximately one hundred birds of this species came in with the Red Phalaropes but remained in one compact flock apart from the other species. While the Red Phalaropes thinned out after that initial flight, the Northern Phalaropes increased. At least three to five thousand birds gathered in one spectacular flock off Monhegan Island during the last week in August (Buchheister, Cadbury and Cruickshank).

POMARINE JAEGER, *Stercorarius pomarinus*.—An adult of this species pursued an Arctic Tern (*Sterna paradisaea*) right past our boat on August 16, 1937.

FORSTER'S TERN, *Sterna forsteri*.—An immature bird was carefully identified on August 16, 1937. The field marks were easily seen and the diagnostic notes heard. As far as I can ascertain this is the first record of this species for the Maine coast.

BLACK GUILLEMOT, *Cepphus grylle grylle*.—At least seventy-five pairs of these birds nest on the islands in Muscongus Bay. Immediately after the young leave the nests in early August, most of the adults disappear from the bay but the young birds appear along the mainland and up rivers where adult birds are seldom if ever seen.

ATLANTIC PUFFIN, *Fratercula arctica arctica*.—In 1936, when we visited Matinicus Rock, we found this species nesting there. We have never seen a Puffin in Muscongus Bay.

NORTHERN RAVEN, *Corvus corax principalis*.—This species is surprisingly common on some of the outlying rocks and islands. One or more may be seen practically every day.

NORTHERN PARULA WARBLER, *Compsothlypis americana pusilla*.—The Parula Warbler nests abundantly in the usnea lichen on Hog Island. During the two summers we have found some two dozen nests ranging from four to fifty feet from the ground. These nests were invariably made of nothing but usnea with rarely a strand of grass or a couple of spruce needles in the lichen cradle.

CAPE MAY WARBLER, *Dendroica tigrina*.—We believe Hog Island to be the farthest-south breeding station of this species along the Maine coast. It is a fairly regular bird in early summer and while no nest has been found, there is no question of its breeding as we have studied the birds on definite territories, seen pairs carrying food into tall spruce trees and watched them feeding young scarcely able to fly.

PRAIRIE WARBLER, *Dendroica discolor discolor*.—On August 5, 1936, Mr. R. T. Peterson and I were astonished to find a Prairie Warbler way out on an ocean rock, Little Green Island, at the mouth of Penobscot Bay, far north of the regular breeding range for this species.

MOORING WARBLER, *Oporornis philadelphia*.—A single bird was seen on the mainland July 20, 1936. Another was seen on Hog Island on June 10, 1937.

RED CROSSBILL, *Loxia curvirostra pusilla*.—Seen three times in 1936. A well-marked flight occurred on July 18, 1937. From that date until the closing of camp in September, this species was recorded every day except two.

WHITE-WINGED CROSSBILL, *Loxia leucoptera*.—Four birds of this species were observed on Hog Island on June 25, 1936.—ALLAN D. CRUICKSHANK, *National Association of Audubon Societies, 1775 Broadway, New York City.*

Notes from Vermont.—**AMERICAN EGRET, *Casmerodius albus egretta*.**—Dr. H. F. Perkins of the University of Vermont informs me that three members of his biology class identified three American Egrets at Sand Bar Bridge, Milton, Vermont, on July 21, 1937. On July 26, Dr. Perkins saw four individuals of this species near the same place. Mr. Elton Clark of Pomfret, Vermont, reports three American Egrets in Shoreham on July 15, 1937. Mr. Clark is a good observer and noted carefully the important marks of identification such as the black legs and yellow bill.

CAROLINA WREN, *Thryothorus l. ludovicianus*.—Miss Anna S. Reynolds of Burlington, Vermont, reports the presence of a Carolina Wren about her grounds from July 10 to October 5, 1936. The bird was seen several times in an excellent position for observation and all the marks of identification were carefully noted and the song was also identified. As Miss Reynolds is a good observer of birds, this is a credible sight record and the first observation of the species within the State so far as I know.

EASTERN HENSLOW'S SPARROW, *Passerherbulus henslowi susurrans*.—One was observed at Wells River, Vermont, on May 13, 1937, and at frequent intervals throughout the nesting season. Such distinctive marks as size, greenish hind neck, chestnut-brown wings and back with conspicuous light stripes, and narrowly striped breast, together with the song were several times noted, making this as conclusive as a sight record can be. Wells River is some distance north of any other known stations.—WENDELL P. SMITH, *Wells River, Vermont.*

Notes from the Cape Hatteras Region.—The following observations made in the region of Cape Hatteras, North Carolina, during the Thanksgiving season of 1937, may prove of interest. The three species listed were also seen and identified by Mr. O. B. Taylor of the National Park Service.

BLUE GOOSE, *Chen caerulescens*.—Two seen in a flock of thirteen Canada Geese on a small pond near Kitty Hawk, North Carolina, November 28, 1937.

DUCK HAWK, *Falco peregrinus anatum*.—One seen at close range perched on a "sand fence" on Pea Island, November 25. One seen on Hatteras Island and another on Pea Island on November 27.

DOVEKIE, *Alle alle*.—A flock of approximately ten of these little northern wanderers was seen and identified on November 25 by Mr. Ed. Green of the park personnel at Cape Hatteras. On the next day two were found washed up on the beach in an exhausted condition and unable to fly. On November 27, still another was picked up on the beach in the same inexplicable state of exhaustion. All three died within a few hours of their capture, and two of the skins which were prepared are now in the University of Richmond collection. Mr. Green states that a few Dovekies have been found on the beach at Cape Hatteras each winter for the past few years.—GROVER PITTS, *University of Richmond, Richmond, Virginia.*

Notes from St. Thomas and cays, Virgin Islands.—On April 19, 1936, I accompanied Major Chapman Grant, U. S. A. retired, on a collecting trip to several cays around St. Thomas for specimens of reptiles, and data on species of breeding birds. We set sail in two of the none too reassuring Cha-cha boats accompanied by

Robert Nichols of the Virgin Islands Experiment Station and Dante de La Garde, whose knowledge of the cays was of value.

WATER ISLAND.—Visited the salt pond on the western end and there observed two Coots (*Fulica* sp.) swimming about, at one hundred yards. Yellow Warblers (*D. p. cruciana*) were abundant in the scrub growth.

LITTLE SABA.—Here bird life was scarce and the usual innumerable Zenaida Doves (*Zenaida z. zenaida*) that nest each season were missing; only an occasional one was seen. Other species recorded: *Larus atricilla*, four; *Fregata m. magnificens*, six, one immature; *Pelecanus o. occidentalis*, eight; *Sericotes h. holosericeus*, four, flitting energetically among a beautiful carpet of yellow cactus flowers. A call from the Major brought me hurrying to the edge of a large brackish pool where a Clapper Rail (*Rallus longirostris caribaeus*) was seen scurrying off into the matted thorny brush. On a sloping hillside, toward an extensive patch of guana-tail (*Agave* sp.), Nichols led the way, then thrusting his arm full length into a tunnel pulled out a fluffy gray ball, the young of Audubon's Shearwater (*Puffinus l. herminieri*). Since many tunnels were found unoccupied no effort was made to estimate the possible number of breeding birds. Later at the base of the sheer cliffs six mummified bodies of immatures were picked up. Before we had left the cay some natives had arrived and presently were seen to return from the slopes bearing several young shearwaters and a young Tropic-bird (*Phaethon lepturus catesbyi*). Robbing the nests of breeding birds is common practice in disregard of the local laws.

COCKROACH CAY.—This cay has a very difficult approach and only the fearlessness and skill of our Cha-cha guide made landing anywhere near a success. From our position at the landing I viewed the perpendicular rock-facing, sheer for two hundred feet, and noted one possible lead by way of reaching the top. This proved negotiable and a half-hour later we reached the high plateau surrounded by perhaps fifteen hundred Brown Boobies (*Sula l. leucogaster*). The birds were fearless and I found it necessary to push many an adult from its nest in order to learn of the contents. Thirty-two nests with eggs and young were perhaps the last of the season's brood with great numbers of immature birds seen on the wing. A pair of Red-footed Boobies (*Sula s. sula*) was found nesting in company with the Brown Booby. The sitting bird, which had a pale-blue bill, allowed me to lift it from its nest and three eggs, but not before inflicting several painful wounds on my hand with its saw-edge bill. Eight Tropic-birds (*Phaethon lepturus catesbyi*) showed some concern as they circled about the rock cliffs but no nests or young birds were seen. An adult Red-billed Tropic-bird (*Phaethon aethereus mesonauta*) was captured beneath a rock ledge and climaxed its resentment in the fiercest ear-splitting scream I have ever heard. The bird in the hand showed the finely barred back and a pair of long tail feathers. After the Major had removed one of the latter the bird was tossed into the air and watched as it soared away to freedom. Two pairs of Oyster-catchers (*Haematopus* sp.) were observed and a male was secured, testes greatly enlarged. The eggs of this species have since been taken at the same locality.

ST. THOMAS AND BIVONI SWAMP.—A flock of sixteen Bahama Pintails (*Dafila b. bahamensis*) was observed and later an American Pintail (*Dafila acuta taitihoa*) in breeding male plumage was flushed. Other species noted: *Himantopus mexicanus*, six; *Totanus melanoleucus*, four; *Totanus flavipes*, eight; *Catoptrophorus s. semipalmatus*, one; *Florida caerulea*, one; *Egretta t. thula*, one; *Ardea h. herodias*, one. In a wooded district in the east end, five Ruddy Quail Doves (*Oreopeleia m. montana*) were seen by La Garde and I watched four Martins (*Progne subis dominicensis*) at play above a valley.—HARRY A. BEATTY, Christiansted, St. Croix, Virgin Islands.

Notes from North Dakota.—Unusual records during fall migration of 1937, are as follows.

OLD-SQUAW, *Clangula hyemalis*.—On October 18, we found an Old-squaw on Deep River in Bottineau County near the Lower Souris Migratory Waterfowl Refuge. From the meager records and bird lists at my disposal, we think that this is perhaps the first record for the State, although it must undoubtedly occur occasionally. Again on October 25, we found an Old-squaw (possibly the same bird) in the same locality. This time we collected the bird, an adult male.

BLACK DUCK, *Anas rubripes*.—On November 6, among seventy-odd ducks handled at our banding station on the Lower Souris Refuge, we found a juvenile male Black Duck. The bird was banded and released, and again recaptured on the last day we operated the traps, November 13. Although the Black Duck occurs occasionally farther east, it is very rare in this area. The only other record is that of a single Black Duck observed on this refuge by Mr. E. R. Kalmbach of the Bureau of Biological Survey, in July 1936.

WHITE-WINGED CROSSBILL, *Loxia leucoptera*.—The first record we have of a crossbill in this area, is that of a male bird picked up in a very emaciated condition by our camp Superintendent, on November 1, 1937, near Kramer, Bottineau County, North Dakota. The bird soon died and was turned over to me as a specimen. It seemed rather odd that we should find another bird later, near Upham, in McHenry County. This bird, a female, was collected. Crossbills are exceedingly rare in this part of the State. The only other record for the State that has come to my attention, was a specimen taken by H. V. Williams from a flock of six birds on July 23, 1905, in the Red River Valley.—C. J. HENRY, *Lower Souris Migratory Waterfowl Refuge, Upham, North Dakota*.

Some birds of the Black Hills of South Dakota and Wyoming.—During the summer of 1935 we spent the period between June 16 and August 7 in the Black Hills of western South Dakota and eastern Wyoming. The birds listed below represent forms unrecorded or imperfectly known from that region.

LONG-BILLED CURLEW, *Numenius americanus americanus*.—On June 16, we saw a number of curlews about six miles northwest of Oelrichs, Fall River County, South Dakota. An adult female taken by Brodkorb is typical of the southern race, measuring: wing, 283; exposed culmen, 183 mm. This is apparently an addition to the birds of South Dakota, since only the northern form seems to have been recorded.

WESTERN SANDPIPER, *Ereunetes maurii*.—Several were seen on Stockade Beaver Creek, five miles southeast of Newcastle, Weston County, Wyoming, during July. Three specimens were taken, a pair on July 18 and an adult female on July 22. Strangely enough, this species is unrecorded from Wyoming.

WESTERN BELTED KINGFISHER, *Megasceryle alcyon caurina*.—We secured three specimens on Stockade Beaver Creek, five miles southeast of Newcastle, Wyoming, between July 16 and 22. All have the large size and short wing-tip of the western race. This form is new to Wyoming.

WATER OUZEL, *Cinclus mexicanus unicolor*.—Although the fourth edition of the A. O. U. 'Check-list' states that the Dipper is of accidental occurrence in the Black Hills, we found the species very common on Spearfish Creek above the town of Spearfish, Lawrence County, South Dakota, and collected a series of specimens, both adults and young of the year, between July 26 and August 7.

CANYON WREN, *Catherpes mexicanus conspersus*.—On July 6, two males, adult and juvenile, were secured by Brodkorb in Salt Creek Canyon, three miles east of New-

castle, Wyoming. In Spearfish Canyon, above Spearfish, South Dakota, he collected an adult male on August 2 and a young male on August 6. We saw others at both localities, but owing to the wildness of the birds and the difficulty of recovering them from the talus, no more could be obtained. The Canyon Wren is new to South Dakota and has seldom been recorded from Wyoming.—PIERCE BRODKORB AND THOMAS D. HINSHAW, *University of Michigan Museum of Zoology, Ann Arbor, Michigan*.

Unusual waterbirds in El Paso County, Colorado.—The following observations were made on the high plains of El Paso County, about twenty-five miles east of Colorado Springs. In certain places where springs or subsurface water has made it possible, ponds have been constructed for the purpose of irrigating farmland or impounding water for livestock. These ponds are very attractive to waterbirds in an otherwise dry country, and many species which were formerly rare are now locally common, or pass through quite regularly.

HOODED MERGANSER, *Lophodytes cucullatus*.—On April 20, 1937, a pair of these ducks was seen on a pond on the C. E. Orr ranch near Falcon. Aiken and Warren ('Birds of El Paso County, Colorado,' Colorado Coll. Pub., Sci. Series, 12: 455-496, 1914) record only one specimen taken or seen in the county previous to that time.

SEMIPALMATED PLOVER, *Charadrius semipalmatus*.—A single individual was seen in company with several Killdeer and some Least Sandpipers near a pond on the E. E. Zanger ranch, two miles south of Peyton, on May 3, 1937. Aiken and Warren do not record it.

LONG-BILLED DOWITCHER, *Limnodromus griseus scolopaceus*.—On May 3, 1937, a flock of nine dowitchers was seen about the ponds on the E. E. Zanger ranch, two miles south of Peyton. They showed little fear of an automobile, and fed unconcernedly as I drove within fifty feet and watched them. The flock was seen repeatedly at two different ponds. On May 5, a single individual was seen feeding on a mud flat on the Banning-Lewis ranch near Falcon, and on May 12, another one was flying about with a flock of Wilson's Phalaropes on the C. E. Orr ranch.

MARbled GODWIT, *Limosa fedoa*.—On May 1, 1937, a dozen of these large waders were present on mud flats about the ponds on the C. I. Anderson farm, where they stayed for several days in a large mixed flock of several species of shorebirds. Another was seen on the E. E. Zanger farm on May 3, and two more were with a flock of Western Willets on the C. E. Orr ranch on May 4.

NORTHERN PHALAROPE, *Lobipes lobatus*.—A Northern Phalarope was seen on a pond on the Fred Herman farm three miles south of Peyton, on October 23, 1936. The water was frozen for several feet from the shore line, but the bird was picking up insect food from the surface of the open water in the typical phalarope manner. Aiken and Warren record this bird as a rare spring migrant, but do not mention any fall records.—W. S. LONG, 830 E. Platte Ave., Colorado Springs, Colorado.

Three noteworthy stragglers in northern Alaska.—Through the kindness of Charles D. Brower, of Barrow, Alaska, the San Diego Society of Natural History has recently come into possession of three straggling bird migrants, of which two are of exceptional interest. These birds were not secured by the collector's gun, but were the victims of their own wandering and, by good fortune, fell into the hands of a person who appreciated their value from a scientific standpoint and preserved them.

MOUNTAIN BLUEBIRD, *Sialia currucoides*.—A female was found in an exhausted condition near the settlement of Barrow on May 20, 1937. All three specimens of

this species so far listed (see Program of Activities of Chicago Academy of Sciences, vol. 4, no. 2, April, 1933) from Point Barrow have been females.

SIBERIAN BANK SWALLOW, *Riparia riparia ijimae*.—This specimen was sent to J. L. Peters of the Museum of Comparative Zoölogy for identification. He marked it *ijimae*(?). His comments were as follows: "Your bird is just as dark as the very darkest *ijimae* examined, and the breast band is even darker. The reason I feel a little doubtful about saying it is *ijimae* is because it is a remade salted skin, and I do not know what effect this processing may have on the normal mouse color of the Bank Swallow." Regarding the salt, the writer examined this specimen when it was received and found that but little salt had been used in its preservation and, further, the time elapsed between its skinning and salting and when it was desalted and prepared as a cabinet specimen was less than six months. Hence the salt could have had but slight effect. This specimen is No. 17638 in the collection of the San Diego Society of Natural History, an adult male, found on June 8, 1937, at Barrow, Alaska. The only other record of this form for North America is also a specimen from Barrow, identified by the late Outram Bangs (see same list cited above). This record bird was in all probability compared with the same series of Siberian specimens as was the bird we sent Mr. Peters. Mr. Bangs also commented on the dark color of the specimen he handled.

WHITE-WINGED CROSSBILL, *Loxia leucoptera leucoptera*.—This is perhaps the most surprising specimen to be taken in that far-northern land that the writer has ever had the chance to examine, and even more surprising is the time of year it was collected—January! The specimen was picked up by a native at Demarcation Point in January, 1937, and brought to Mr. Brower in the flesh. When the writer first saw the label he questioned the month for, although in Mr. Brower's handwriting, it was abbreviated, and it was taken to be June. However, Mr. Brower recently paid a visit to the Natural History Museum at San Diego and we conversed at length on the peculiar phenomenon of this bird's wandering such a great distance from the coniferous forest belt, and ending its journey of life on the tundra so far within the Arctic Circle in the dead of winter!—LAURENCE M. HUEY, *San Diego Society of Natural History, San Diego, California*.

RECENT LITERATURE

Dickey and Van Rossem's 'Birds of El Salvador.'—After a youthful collecting trip to El Salvador in 1912, the junior author suggested to the late Donald R. Dickey a systematic survey of this small but unknown country. Accordingly most of the years 1925, 1926, and 1927 were occupied in field work, the expense of which was borne entirely by Mr. Dickey. These collections, totalling over four thousand specimens, were obviously made with the maximum degree of competence and judgment, and furnish the basis for the report¹ now before us. This was originally planned under joint authorship and was preceded by a number of papers describing new forms. As a matter of fact, Mr. Van Rossem wrote the initial rough draft and Mr. Dickey intended to write the final copy. The latter's health, however, failed completely in 1930 and he requested Mr. Van Rossem to put the manuscript into shape for publication. This task was completed shortly before Mr. Dickey's sudden death in April 1932, which incidentally destroyed all hope of prompt publication. The reviewer may be permitted a word on the human side of the book before passing to the scientific. Mr. Dickey unquestionably made valuable suggestions regarding the final account and had various ideas and wishes which have been scrupulously carried out. The pages of this book are a tribute to a loyal and devoted friendship.

The book begins with various introductory sections containing an historical summary, a detailed gazetteer, and full and clear accounts of climate and topography. El Salvador is a very small country, lying wholly on the Pacific slope of Central America. The rich avifauna of the Humid Caribbean forests is consequently lacking. Almost the whole country is in the Lower Arid Tropical Zone, up to elevations varying from 2000 to 3500 feet. Above these elevations, and occasionally reaching to 9000 feet, lies the Upper Arid Tropical Zone, chiefly on the southern or Pacific slopes of the mountains, wherever there are marked dry and rainy seasons. The third life zone in El Salvador is called the Humid Upper Tropical Zone, which is the Subtropical Zone of Chapman and others. It is best developed on the northern slopes of the high mountains along the Honduras frontier, with a slight tinge on the summits of certain isolated peaks near the coast. Of the 446 species and subspecies of birds known to occur in El Salvador, 308 may properly be considered to constitute the local avifauna. Of these, 161 are listed as characteristic of the Arid Lower Tropical; 51 of the Arid Upper Tropical; and 45 of the Humid Upper Tropical. A very brief discussion of geographical distribution then ensues. El Salvador is so small a section of Central America, that its avifauna is heterogeneous, composed of either widely ranging birds, or groups of species and subspecies which have their distribution centers outside the boundaries of the country. The authors recognize a western Guatemala avifauna, a western Nicaragua lowland avifauna and a Honduras highland avifauna, which together total about 21 per cent of the resident population. Endemism is confined to two volcanic peaks: two subspecies on the summit of the Volcan Santa Ana, and twelve on the Volcan San Miguel, of which five are confined to the summit, while seven spread out for varying distances over the adjacent lowlands.

In comment on this whole section, it is first of all fair to the authors to say that their remarks are as much as possible confined to El Salvador. Thus little or no mention is ever made of the distribution of any bird outside of El Salvador, and

¹ Dickey, Donald R., and van Rossem, A. J. The birds of El Salvador. *Field Mus. Nat. Hist., zool. ser.*, 23: 1-609, pls. 1-24, text-figs. 1-29, March 21, 1938.

this often very necessary knowledge is assumed to be in the possession of the reader; if lacking, erroneous ideas might certainly result. At least two-thirds of the birds listed as characteristic of the Arid Lower Tropical, are not really characteristic of this zone at all if their ranges outside of Salvador are considered and there is no way of telling which are. They are characteristic of this zone only in that they do not range upward into the Arid Upper Tropical in Salvador. This method of treatment can be criticised as being unnecessarily local, and in the opinion of the reviewer the known learning of the authors did not require so modest a restriction of the discussion.

There are the usual difficulties with the use of terms, but here the authors usually make their position quite clear by defining them. They prefer the term Humid Upper Tropical to Subtropical and are entitled to their preference. They reject the term Temperate for any area south of the North Temperate Region, barring mountain peaks with freezing temperatures, and this explains why at 9000 feet they regard themselves as in the Arid Upper Tropical Zone, whereas Chapman and Griscom would put them in the Temperate Zone. One suspects that, should they have dealt with a much larger area with high mountain masses, they would have thought more of the low mean-annual temperature and less of the minimum temperature and the narrow daily range, especially if the avifauna were sharply distinct from that of the Arid Upper Tropical below it. They either ignore or disbelieve in the division of Central America into faunas as defined by Chapman, based primarily on endemic genera and species. In speaking of the Honduras highland avifauna and the western Nicaragua lowland avifauna, they are really speaking of minor groups of species and principally subspecies. They regard the four zones of the Tropical Region in Central America as "fully as well set off" from each other as any of Merriam's well-known zonal divisions of the Boreal and Austral Regions. Here they are certainly open to attack.

The annotated list occupies over 500 pages of the book. Under each species is given the citation of the original description, a list of Salvador specimens examined, records in the literature, localities where the species was observed, dates whenever important, a condensed summary of the status in El Salvador, nesting when known, and plumage notes if any. The meat of this section is really under 'Remarks.' This includes a masterly and authoritative discussion of the systematic status of the form involved, and pleasingly written accounts of personal observations on the general habits. Outstanding features of the systematic discussion are the broad-mindedness of the general approach and the courtesy with which differences of opinion are handled. Van Rossem is perhaps particularly interested in subspecific variation and believes in naming all slight average differences. He is well aware, however, how relatively slight is our knowledge of Central American birds, and how tentative are all systematic opinions based on meager material, and how certain they are to change when additional specimens and information arrive. This premise, indeed, accounts for the brevity of the section on geographical distribution. The reviewer has been particularly interested in Central American birds for twenty years. In the present volume he has a mine of information to which he will constantly refer and often defer for years to come.

The book is a credit to the publisher. The format, typography and paper are excellent. Twenty-three fine half-tone plates illustrate Salvador scenery and avian habitats, while one shows the astonishing local variations in the Bob-whites. All do full justice to excellent originals. Numerous text-figures give a map with collecting stations, illustrations of the distribution of the life zones, and maps showing the distribution of various birds in El Salvador where two or more critical races occur in

the country. Authors and publisher alike are to be congratulated on so excellent a publication, after such long delay.—L. G.

The new 'Handbook of British Birds.'—The immediate success of the 'Practical Handbook of British Birds,' completed in 1924, resulted in its going entirely out of print ten years later. The present work,¹ although in a sense a new edition, has been so thoroughly revised and rewritten in the light of later experience and more recent knowledge that it is essentially an independent work, well meriting its new and shorter title. Here is a vast compendium of well-presented information, covering the important facts ascertained in regard to the forms treated, uniformly arranged and with well-chosen side headings to make the subject matter quickly available.

Following an illustrated key to the orders and suborders of British birds, the body of the book presents for each group the chief diagnostic characters, then for the several species, a statement of the habitat, the field characters and general habits, voice, display and posturing (including 'courtship' and 'injury-feigning' as well as typical attitudes), breeding habits (including nesting site, construction of the nest, number, size and color of eggs, incubation and fledgling periods, and parental activities), then food, distribution and migration in the British Isles, and distribution abroad, ending with a careful description of the plumages and moults, the measurements, color of soft parts, and a brief statement of diagnostic characters and those of allied forms. In these accounts the portions contributed by each of the four authors are followed by the initials of the responsible writer.

The 'Introductory Notes' provide much that is illuminating or interesting. For the most part the names of the orders, suborders and families are those used in the well-known arrangement proposed by Dr. Alexander Wetmore, with a few deviations to which the authors call particular attention, such as the use of Apodiformes for Micropodiformes, and of Podicipiformes and Colymbiformes for the Colymbiformes and Gaviiformes, respectively, of Wetmore. The deliberate use of Colymbiformes in a different sense seems particularly unfortunate, and one may regret that the authors, while admitting that Wetmore's sequence "is probably the most satisfactory yet devised," have thought it best to reverse this in order to conform with that of Hartert, as being more familiar to European workers. However, for convenient reference, both arrangements are given in parallel columns for comparison, so that little criticism can be made. In further conformity to European custom, the sequence of families is also different, beginning for the Passeriformes with the crows and ending with the swallows. Of the twenty families of passerine birds represented in the area covered, the present volume treats of thirteen, including 123 numbered species. The paragraph by Mr. Tucker on the transcription of bird song has many good suggestions, which if followed, might lead to more uniform and satisfactory renderings. This author also provides a chart to show the song periods of the different passerine birds of the British Isles. A glossary of terms, a comparative table of inches and millimeters, and diagrams illustrative of measurements and avian topography complete the preliminary matter. A valuable feature is the frequent reference to important studies made by continental workers, for the readiness with which the authors have been willing to go well outside the confines of the British Isles to include results of recent intensive investigations by ornithologists of the neighboring countries, makes the handbook far more than a local treatise and places it in the front rank as a work of general reference on the birds of western Europe.

¹ Witherby, H. F., Jourdain, F. C. R., Ticehurst, N. F., and Tucker, B. W. *The Handbook of British Birds* [Volume I] (Crows to Flycatchers) [8vo, xi + 326 pp., 33 pls., text-figs, maps, 1938; H. F. & G. Witherby Ltd., 326 High Holborn, London. Price 21 shillings to subscribers to the five volumes, 25 shillings for the separate volume.

The editor expresses satisfaction in being able to present with the new handbook a series of colored figures illustrating the adults and young of practically all the species in summer and in winter plumage, thus adding greatly to the usefulness and beauty of the work. Most of these figures are by the well-known artist, Mr. M. A. Koekkoek of Leiden, and are adapted from a series originally prepared for van Oort's work on the birds of the Netherlands. While these figures are necessarily small, and as bird portraits have little merit except as maps of color, they are so excellently reproduced as to show essential details remarkably well. Two full-page plates showing the heads of allied species of pipits and of wagtails are by Grönvold and stand in somewhat marked contrast for their beauty of color and execution. There are in addition a number of text-figures illustrating diagnostic details of closely related forms.

Although there is no table of contents, a good index practically obviates the need. Care has been taken to exclude from the "British list" many exotic species on the ground that the specimens taken are escaped cagebirds. These are mentioned in small type at the proper places; yet there does not seem to be conclusive proof that records of such North American birds as the Red-wing, Meadowlark, Goldfinch, Junco, White-throated Sparrow and some others, may not represent occasional strays in the autumnal migrations. The authors have chosen for each species but a single English name as an aid to a uniform usage, but have in a few instances preferred to coin vernacular names other than those in use in the A. O. U. 'Check-list' as Coues's Redpoll instead of Hoary Redpoll. Such matters, however, and the occasional use of other generic names (as *Carduelis* for the redpolls) are in part matters of preference notwithstanding that uniformity of usage is eventually desirable.

The new handbook is a work which cannot fail to find immediate approval and extensive use by ornithologists, whether professional or amateur, on both sides of the water, as a convenient and authoritative reference book on birds of the western palaearctic region. One may await with anticipation the four remaining volumes contemplated for the completion of this latest book on British birds.—G. M. A.

Archer and Godman's 'Birds of British Somaliland.'—Bordering the southern shore of the Gulf of Aden and extending thence inland for varying distances up to about two hundred miles, lies British Somaliland, a region still but little visited by ornithologists. Far from being an uninviting and barren country, as might be supposed, it is, like northern Kenya Colony, a fascinating land, arid to be sure, but breaking into verdure with the onset of the rains, parched and hot at seasons near the coast, with areas of desert, scrub and grassland, of a varied topography rising toward the south to the highlands of Ethiopia. Faunally it has much in common with Italian Somaliland adjoining on the east, and with the country stretching southward to the Guaso Nyiro region of northern Kenya.

In the two beautiful volumes¹ here reviewed, the authors have brought together in narrative form the more important facts hitherto ascertained as to the general habits, distribution and nesting of the birds of the country. During many years of official duties both in British Somaliland and in Kenya Colony, Sir Geoffrey Archer has made use of abundant opportunity to observe and collect birds and their eggs, thus acquiring an extensive first-hand experience which lends authority to his statements. For the more technical aspects of their work the authors acknowledge the assistance of the bird department of the British Museum. One may guess that a large share of this part of the work fell to the lot of Sir Archer's collaborator.

¹ Archer, Sir Geoffrey, and Godman, Eva A. The Birds of British Somaliland and the Gulf of Aden | their life histories, breeding habits, and eggs. Large 8vo, London, Gurney & Jackson, 33 Paternoster Row, E. C., 2 vols.: pp. 1-xcvi, 1-285, 21 half-tone pls., portrait, 10 colored pls., map; pp. 286-626, 10 colored pls., map, 1937. £3/3/-.

The introductory chapters include a brief historical sketch of the country and of the British military operations incident to its pacification, followed by an outline of the history of its exploration and a more extended chapter on the aspects of the country itself, its varied divisions and their characteristics, avifauna and peoples. Excellently told in plain, narrative style and illustrated by numerous photographic reproductions, this section brings vividly to mind the face of the land, from the hot burning sands of the coastal strip, to the acacia-dotted plains of the interior and the majestic hills and mountains of the hinterland. A complete list of the birds hitherto known from the country (many of them discoveries of Sir Archer) precedes the general account; it comprises 422 species and subspecies, of which 170 have been found to breed within the limits of the country. The accounts of these species follow in the order of Sclater's well-known 'Systema,' the nomenclature of which is in general adopted. The first volume includes the ostrich, waterbirds and raptorial species, while the second treats of the francolins, rails, bustards, thick-knees, shorebirds, gulls, sand grouse, button-quail and pigeons. For each there is a short description of the external characters, then an account of the general distribution and the special occurrence in Somaliland, the characteristic haunts and behavior, and the nesting and eggs. Often there is pertinent discussion of the subspecific relationships with forms of neighboring areas and quotations from various authors as to the habits in this or other parts of Africa. Brief keys precede each of the groups treated, while in the appendices are found an interesting key to the larger types of nests and a calendar of nesting dates showing the relation of these habits to the dry and the rainy months. One is surprised at the shortness of the bibliography of papers and books dealing with the birds of the country. It is clear also, that our knowledge of the birds of Africa has not yet progressed very far beyond the somewhat generalized state, in which, although the more obvious facts of their life histories are in many cases made out, extremely few intimate studies of nest life, social behavior, and individual peculiarities have yet been made.

The two volumes are a superb example of book-making. The well-arranged subject matter, the excellent typography and generous spacings are pleasing to the eye; each volume is well indexed, while the sixteen beautiful colored plates of birds by Thorburn and the four of eggs by Grönvold are well executed, the former usually combining with the birds shown, some characteristic bit of Somaliland scenery. The only slight blemish observed is the consistent misspelling of 'iridescent' and of the Latin and vernacular name of the rock dassie as 'hierax' instead of hyrax. Two additional volumes are projected, to deal with the land birds, so that as the first of the more inclusive books on the avifauna of East Africa, this should prove a worthy counterpart of Bannerman's 'Birds of Tropical West Africa.'—G. M. A.

Hibbert-Ware on the Little Owl.—Following certain preliminary papers, this¹ is the final report of an investigation to settle moot questions as to food habits of the Little Owl (*Athene noctua vidalii*), a bird established in Great Britain, 1879–1889. The species is less common than it once was, probably as a result of the "settling down" process observed in the case of various introduced animals; clutch and brood sizes are less than in the most prosperous period. Pellets are described and illustrated in comparison with those of other birds of prey. They form the principal basis of the investigation, 2460 having been analyzed; in addition, material from 76 nests and larders was examined, and the contents of 28 gizzards identified. The study was undertaken especially to test the validity of claims that the Little Owl consumes

¹ Hibbert-Ware, Alice. Report of the Little Owl inquiry 1936–37 organized by the British Trust for Ornithology. H. F. and G. Witherby, London, 74 pp., 8 pls., 10 tables, 1938.

many chicks of game birds and poultry an effort was made to get material that would illustrate the full extent of such depredations. The results show that game chicks are taken rarely, only two, and seven poultry chicks being found destroyed in 16 months of investigation by the field workers and food analyst. The Little Owl feeds largely on insects at all times of the year, taking chiefly forms that are most abundant. Small rodents also are eaten in all months and birds are rather freely taken during the nesting season. No general summary of economic value is given, but opinions of authorities in five other countries are quoted.—W. L. McATEE.

Buick on 'The Moa-hunters of New Zealand.'—In two previous books of a popular style, the author has given a general historical sketch of the discovery of bones of Moas in New Zealand, with some account of the birds themselves. In the present volume¹ he pursues this interesting subject further, chiefly from the standpoint of the archaeologist. Were these huge birds still living when the islands were first visited by man? Who were the people that hunted them and how long ago did the last birds perish? These and kindred questions the author takes up in the light of accumulated evidence, in part from old Maori tradition but chiefly from a study of the ancient kitchen middens and camp sites, long since abandoned and forgotten, where the huge leg bones and other parts of these birds are still to be found. Interest in these matters began when, in 1838, William Colenso and Reverend William Williams in the course of their missionary work in the North Island were told a fabulous tale of a fierce and dangerous Moa that lived on a bleak mountain side,—the last of its race. Williams was the first to send a consignment of Moa bones to Sir Richard Owen whose genius at once perceived their extraordinary interest; but the apparent lack of settled tradition concerning so striking a bird made Colenso loath to believe that the native Maoris could ever have known it in life.

After briefly tracing the conflicting views of the earlier naturalists—Colenso, von Haast, Mantell, Hector, and others—on the contemporaneity of the Moas with the earlier human inhabitants, the author reviews the abundant evidence from excavations and inspections of many of the old camp sites where the proof is ample that the bones of these giant birds were mingled with shells of mollusks and fragments of other food animals as dog, seal, penguin, albatrosses, owl parrots, in the ancient ovens of earlier human inhabitants. Often worked bones of the Moas were thus excavated, used in making fishhooks, awls, or decorative pieces. Mingled with these remains were abundant fragments of the shells of Moa eggs, as well as occasional stone implements, some of the polished type. The author concludes from his study that the ovens were of a characteristic Polynesian type and that doubtless the moa-hunters were of the same stock as the present-day Maoris. According to tradition the first great colonization by these peoples was about 1350 A.D., when the newcomers found the Moas abundant. Probably the birds were then present in numbers, perhaps more abundant on the South than on the North Island of New Zealand. The evidence seems to show that they had become extirpated, however, some time prior to the arrival of Captain Cook, perhaps even as far back as three hundred years ago, or perhaps somewhat less. Very little tradition of the Moas survives, but that gleaned in past years from the older natives indicates that the birds had the body feathers gray, and these were used in making mats; they inhabited the banks of rivers, lakes and swamps, feeding upon young shoots of water plants, perhaps even on fishes. Their cry was a loud screech or boom that could be heard at a distance.

¹ Buick, T. Lindsay. *The Moa-hunters of New Zealand* [Sportsmen of the Stone Age.] 8vo, xiv + 260 pp., illustr., 1937; Thomas Avery & Sons, Ltd., New Plymouth, New Zealand. 10 shillings.

They were hunted in various ways: by ambushing them as they followed well-worn paths, when they could be speared at close quarters; at times they were driven on to a point of land or by means of bush fires they could be forced into swamps and rendered helpless; again they were caught in pitfalls or run down by relays of hunters. The author believes that without doubt man was the cause of their final extinction.

The book is well written and presents a very readable, if rather general account of the birds themselves, of which apparently at least three genera and perhaps seven species are found in association with human relics. The illustrations show several of the sites excavated and there are interesting photographs of some of the older naturalists who were concerned with the earlier discoveries. The advantageous combination of archaeology with ornithology helps to throw new light on the melancholy history of these remarkable birds and to point the finger of guilt once more at the human offender.—G. M. A.

Roberts's 'Logbook of Minnesota Bird Life.'—In this attractive volume¹ the author has brought together in book form the bimonthly seasonal reports on bird life in the Minneapolis region that he has prepared for the columns of 'Bird-Lore' during the past twenty years. In a few cases these reports were written but for one reason or another were not published at the time; all have been carefully revised, and there are many brief comments in footnotes or in parenthesis calling attention to changes observed in the intervening years. There is thus a certain amount of new matter and the whole furnishes a unique and interesting review of the aspects of bird life in the region from season to season during the last two decades. Each of the twenty chapters covers usually a complete year from October to October or from December to December, giving thus a summary of the four seasons. The book is appropriately dedicated to the many observers who have contributed their field notes for the author's use in preparing the reports.

A consecutive reading of the pages, chapter by chapter, brings forcibly to view the fact that in this northern State of the mid-West each year presents some unusual feature of avian occurrence or of climatic condition, so that the recurring seasons show not only the general activities of the more usual bird population but also some special phenomena of particular interest. In such a marginal region the critical winter or spring conditions are seldom of an average nature; there is no such thing as a 'normal' season, but each is a picture by itself. Again, such a perspective record over a period of years brings out the fact of slow but constant change in the various elements: bird life in such a region is by no means of uniform or static quality. Thus the Green-winged Teal has in recent years become more common as a breeding species; the Louisiana Water-Thrush has considerably increased as a summer resident as far north as Minneapolis since 1918, and the same is true of the Field Sparrow; of late years, too, the Widgeon has nested in small numbers, while in 1931 it is noted that the Blue-gray Gnatcatcher is "evidently becoming established as a regular though still rare summer resident." There are winters of much or of little snow, occasional summers of great drought, periods of drastic contrasts in weather, and seasons of mild and temperate conditions, all of which may or may not be clearly reflected in their influence on bird life. It is plain that such a continuous record of observations written at the time and covering a considerable period of years is of far more value in an appraisal of these gradual changes and fluctuations in the avian population than are the more usual sorts of comparisons made from occasional retrospects or based on recollection alone. Thus the notes here presented in

¹ Roberts, Thomas S., M.D. *Logbook of Minnesota Bird Life 1917-1937* | 8vo, xii + 355 pp., illustr., 1938; University of Minnesota Press, Minneapolis, Minn. \$2.50.

convenient form become a permanent store that may be drawn upon at any time for the working out of questions that later arise.

The book itself is of convenient size, well printed and artistically bound. As chapter headings there is a series of well-executed vignettes showing various species of birds or mammals, while the frontispiece is reproduced from an etching showing a Duck Hawk perched (somewhat uncomfortably) in a tree. All these are the work of Mr. W. J. Breckenridge. An exhaustive analytical index will serve future use in finding notes on the many individual species. The volume comes as a contribution from the Museum of Natural History of the University of Minnesota, of which the author is Director. It should prove of much permanent value.—G. M. A.

Ridgway's *'Scientific Illustration'*¹ will be accorded a warm welcome not only by those wishing to illustrate their own contributions but by professional illustrators as well, who often are unacquainted with the special requirements of certain types of technical papers. From his long experience in this work, not only in preparing colored and black-and-white figures of birds and other subjects in various branches of natural history, but also as (formerly) chief illustrator for the United States Geological Survey, the author is well qualified to offer some of the results of his own training for the benefit of others less skilled. Every scientific student in these times finds occasion to present with the results of his work some sort of figures to embellish or to make clearer the written text. No better method has yet been devised for transmitting to the mind the general appearance of an object or scene than a visual reproduction of it; yet as the author remarks, "the seeming lack of progress . . . in the use of illustrations for scientific purposes compared with the abundance of those now used in all other kinds of literature perhaps indicates that scientific authors should give greater consideration to the inherent value and subservient character of good illustrations."

After preliminary remarks on the purposes and advantages of illustrations, the author proceeds to give concise and helpful suggestions as to the choice of appropriate material, the respective advantages of line drawings, pencil sketches, photographs, black or white backgrounds, and kindred matters, the essential requirements of drawing, merits of different types of paper, and a list of drawing instruments needed. There is a brief and useful discussion of the principles of light and shade, with the suggestion that lighting of the objects be uniformly from the left-hand side for convenience as well as for comparative use. The great value of legitimate retouching is vividly illustrated by 'before and after' examples, and the results that may be attained from apparently hopeless material are well shown. Especially to those of less experience, the suggestions for making up plates, calculating the proportionate sizes and reductions, arranging figures and their lettering, should not only prove of great value to the writers of scientific papers, but in turn cannot fail to relieve the editors to whom such papers are submitted and to whom the miscellaneous figures often accompanying manuscripts become a time-consuming puzzle before they can be finally adjusted for publication. There is much on the preparation of maps and geological sections, a subject on which the author speaks with high authority, and finally an interesting and clear account of methods of reproduction, a subject often more or less of a mystery to many. An appendix presents a number of tables for use in map-making, metric equivalents, chemical abbreviations, Greek alphabet and mathematical signs, and there is a good index. The colored frontispiece shows a Meadowlark and its nest with appropriate background.

¹ Ridgway, John L. *Scientific Illustration*. 8vo, xiv + 173 pp., col. frontispiece, 22 pls., 23 text-figs., 1938; Stanford University Press, Stanford University, California. \$4.00.

The book is handsomely printed in large clear type, with many figures by the author to illustrate the points and principles explained in the text. It should prove of immediate practical value to all who have occasion to prepare scientific papers in any branch of natural history.—G. M. A.

Bennett on the Blue-winged Teal.—Prepared as a doctorate thesis in graduate study at the Iowa State College, this monograph¹ deals particularly with the migrations, wintering grounds, courtship, breeding and food habits of the Blue-winged Teal with a consideration of its special requirements and its utilization as a game bird. The author has studied this duck more especially on its breeding grounds in Iowa and has followed it to Mexico to obtain first-hand knowledge of its winter status in that country. Many interesting points in its life history are brought out. It is a characteristic duck of open rolling prairie that provides an abundance of small sloughs, marshes and ponds, where grasses, particularly in Iowa the bluegrass, furnish abundant nesting cover. The absence of such conditions in the East no doubt accounts for its scarcity as a breeding species eastward of the Great Lakes; its center of abundance is in the middle west of North America from Saskatchewan southward to northern New Mexico. Since the beginning of this century, hunting, agriculture and drainage have wrought a great change in its breeding grounds in the United States, so that at the present time about eighty per cent of the teal population is bred in western Canada. Other facts of interest are: the obvious preponderance of males, which show an excess of from four to as much as eighteen per cent over females, not only among the adults but among the young ducklings as well; the avoidance of bush cover in choice of nesting sites; the 'waiting territory' selected by the male of a nesting pair during the period of egg-laying and early incubation by the female; the later desertion by the males. The incubation period is between twenty-one and twenty-three days. The interesting fact is discussed that in Iowa marshes nearly five per cent of teal's nests are parasitized by the Ring-necked Pheasant. In such cases the teal ceases to lay eggs when the nest is full so that the number of pheasant eggs lowers the number laid by the teal. This parasitism is thought to be due largely to an overabundant pheasant population, and is interesting as indicating a possible beginning stage of a brood-parasitic habit. In only one case did the number of pheasant's eggs exceed those of the teal in such a nest.

After a consideration of food, enemies and disease, with the inclusion of much original information, the author takes up the effect on the teal of drainage and agriculture and the optimum conditions of the bird's requirements. The maintenance of a proper water level over the prairie marshes is found to be the greatest single factor in production of food for these ducks. The concluding chapters take up the more practical aspects of providing a supply of birds for shooters and means of limiting the annual kill to a proper percentage of the ducks produced. In a final summary, eighty-four brief paragraphs give the principal results of the study. There is a short bibliography of works to which reference is made and a good index. A colored frontispiece by Mr. Sid Horn shows fairly well the breeding plumage of both sexes, while numerous half-tone insets reproduce—if often, somewhat dimly—various characteristic haunts and nesting conditions. Altogether this neat little volume offers an excellent account of the life history of the Blue-winged Teal with much in the way of practical suggestion for the safeguarding of the species and the proper regulation of its pursuit as a gamebird of our prairie States.—G. M. A.

¹ Bennett, Logan. *The Blue-winged Teal | its ecology and management* | 8vo, xiv + 144 pp., illustr., 1938; Collegiate Press, Inc., Ames, Iowa. \$1.50.

De Beer's 'Development of the Vertebrate Skull.'—In this rather ponderous volume¹ we have what is virtually a summary of all that has been done in the study of the development of the skull. For the various classes of vertebrates the author takes up first, the much-discussed matter of the segmentation of the skull, and concludes that the evidence from various angles indicates that at least in *Amia*, there are nine primitive segments. The major part of the book (Section II) takes up group by group, as illustrated by better-known examples, the development of the chondrocranium and of the osteocranium, while in a third section are considered the general morphological relations of certain cartilages. The final (fourth) section sums up the data on the embryology, phylogeny and growth of the skull, and concludes with an extensive bibliography and index. There are one hundred and forty-three plates of outline and wash drawings illustrating the text.

The portions referring to birds are rather limited but include brief summaries of investigations carried out on the domestic duck, fowl and pigeon, the kestrel, house sparrow, ostrich and apteryx. Of particular interest are the generalizations as to the types of the palate in birds. After summarizing the work of Huxley and his recognition of four different classes of palatal structure, and the later revision by Pycraft reducing these to two, palaeognathous and neognathous, the author suggests that after all the former type may not necessarily be phylogenetically primitive. For the well-developed basipterygoid processes of the dromaeognathous skull suggest a "kinetic" type, in which the pterygoid is capable of sliding, whereas the neognathous palate with its hinge between the palatine and the pterygoid is "akinetie" and phylogenetically is more primitive than the broad suture between these bones in the palaeognathous skull. Further, if the latter were more primitive, the author suggests that its occurrence in adult birds would be expected to be more widespread than it is. Here, however, the answer that might be given by palaeontology is and perhaps will ever be, incomplete.

For a volume of this size it is well printed and substantially bound, and should form for many years to come a standard work of reference for students of the morphology of the skull.—G. M. A.

Griscom and Brewster on 'Birds of the Lake Umbagog Region.'—Three parts of Brewster's posthumous work on the birds of Lake Umbagog have already been noticed in 'The Auk,' carrying the list through the Icteridae, the point where it was left by Brewster at the time of his death. The fourth and concluding part² is now issued, prepared by Mr. Ludlow Griscom from the notes and journals of Brewster. To conform with the three other sections the order of species remains that of the third edition of the 'Check-list,' with the names, however, brought to date as in the fourth edition, issued since publication began. It would have been permissible therefore to have placed the English Sparrow in its proper family as a ploceid rather than to have retained it in the Fringillidae. The compiler has followed the same treatment as begun by Brewster in the preceding parts, giving for each species a brief statement of its general manner of occurrence, followed by interesting, if often disconnected, quotations from Brewster's journals. In some cases these excerpts present much valuable detail of nesting or of migration as in the case of the Migrant Shrike where the single instance of breeding is minutely described, or of the

¹ De Beer, G. R. *The Development of the Vertebrate Skull*. 8vo, Oxford, the Clarendon Press; xxiv + 552 pp., 143 pls.

² Griscom, Ludlow. 'The Birds of the Lake Umbagog Region of Maine. Compiled from the diaries and journals of William Brewster.' *Bull. Mus. Comp. Zool.*, 66: part 4, 523-620, Feb. 1938.

Veery whose nocturnal migration in the early autumn was traced by the calls of passing birds. For certain of the rarer warblers, as the Cape May and the Bay-breasted, there is a wealth of interesting detail on nesting habits, with valuable comment by the compiler emphasizing the changes that have taken place in the status of various species during and since Brewster's earlier days. Of especial importance are Mr. Griscom's remarks in the concluding pages in which are given the dates of Brewster's visits to the region (chiefly in summer and autumn, thus accounting for the great lack of spring notes), a gazetteer of the localities he mentions, and more particularly a summary of the important changes that have taken place in the representation of various birds in this region during the last decades. In addition the compiler has for the first time brought out the fact that many of Brewster's notes on rarer birds of the region, refer to observations across the state-line in New Hampshire rather than in Maine, for the lake lies partly in both States,—a point of some interest to compilers of 'state lists.'

The great value of this account of Umbagog's birds lies partly in the fact that it affords such an excellent basis for appraising the effect of human occupation and forest clearing upon the avifauna of the region in the course of a half century or more and partly in presenting a vivid picture of bird life in primeval northern New England. The compiler's work has been carefully done, with the advantage of a long perspective, so that he has been enabled to bring out many important contrasts and comparisons. It is a satisfaction to have this valuable review finally brought through to a close. It might have been helpful if an index to the entire volume in its four parts had been added.—G. M. A.

Sprunt on Birds of the Southern Sanctuaries.—The splendid work of the Audubon Societies and the National Association of Audubon Societies in saving from destruction the larger herons and ibises of our southern States is beautifully memorialized in this brochure of word and color pictures describing the birds and their haunts in Florida, Georgia, the Carolinas, Louisiana and Texas. Due to the effective protection given them through these societies and their devoted wardens, the breeding colonies of these spectacular birds have been gradually built up during the last quarter century from a rapidly dwindling remnant to their present populous state, so that most of the species are no longer near the danger point. Nevertheless, vigilant care must in no whit be relaxed lest human avarice and thoughtlessness continue to menace their existence.

For each of some twenty species the author, who is Supervisor of the Southern Sanctuaries, here¹ presents a well-written account of the general habits and haunts, with much useful information, prefaced by a brief statement of the derivation of the Latin name, a list of local vernacular names and an outline of the range in the United States. It is shown that the economic importance of such species as the Little Blue Heron and the White Ibis may be considerable in that they prey largely upon the crawfish that burrow into levees, while the esthetic value of these and other large birds is no less significant. Eleven full-page color plates depict nineteen species. Of these, the frontispiece is from a color photograph by S. A. Grimes showing a Roseate Spoonbill among mangroves, said to be the first picture of its kind ever published. It may be added without exaggeration that the seven plates drawn by Roger T. Peterson are not inferior, while the three other plates, executed by Francis L. Jaques, illustrate groups amid characteristic surroundings and are reproduced

¹ Sprunt, Alexander, Jr. *Beautiful Birds of the southern Audubon Sanctuaries*. Large 8vo, 40 pp., including eleven colored plates, National Ass'n of Audubon Societies, New York City, bull. no. 8, 1938. \$1.00.

from Howell's 'Florida Bird Life.' Of these last, the painting of a flock of White Ibises circling upward, strikingly illustrates this peculiar social habit of the bird.

Concerning the name *Casmerodius*, said to be of "derivation unknown," it may be suggested that it is carelessly compounded from the Greek *chasme*, gape, and *herodias*, a heron. In view of the large size of the page and the excellence of the illustrations, it is a pity that this pamphlet could not have been issued with some form of stiff covers for its better preservation as an educational and decorative work.—G. M. A.

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- CORTI, ULRICH A. Der Rotmilan, *Milvus m. milvus* (L.) in der Schweiz. Der Ornith. Beobachter, L'Ornithologiste, 34: 205-209, 1937.—The distribution, migration and general occurrence of this kite in Switzerland are briefly given. Breeding records are few; the author lists those known to him.
- CORTI, ULRICH A. Mitteilungen über das Vorkommen der Turteltaube, *Streptopelia t. turtur* (L.) in der Schweiz. Der Ornith. Beobachter, L'Ornithologiste, 34: 209-215, 1937.—Gives a list of records for the Turtle Dove in Switzerland. Though most of the occurrences fall in May and June, there is an astonishing lack of breeding records, of which but two are given.
- CREAGER, BARON. Cypress swamp of the Kiamichia. Amer. Forests, 44: 160-161, 187, 3 figs., Apl. 1938.—Account of the preservation of this area in Oklahoma, where American Egrets and Anhingas nest.
- DEIGNAN, H. G. A new race of *Yuhina flavicollis*, from the mountains of North Siam. Proc. Biol. Soc. Washington, 50: 217-218, Dec. 28, 1937.—*Yuhina flavicollis rogersi*.
- DEIGNAN, H. G. A new *Myophonus* from North Siam. Proc. Biol. Soc. Washington, 51: 25-26, Feb. 18, 1938.—Describes a new Whistling Thrush, *Myophonus caeruleus rileyi*, type from 7000 feet on Doi Angka, Siam.
- DENHAM, REGINALD. Birds of the Cerdagne. Bird Notes and News, London, 17: 137-140, pl., 1937.—Brief notes on birds seen in an excursion to the Spanish Pyrenees.
- DE SCHAUNSEE, RODOLPHE M. On a new species of drongo from Siam. Proc. Acad. Nat. Sci. Philadelphia, 89: 337-338, Oct. 20, 1937.—New: *Dicrurus bondi*, from Ubol-Chanuman, eastern Siam.
- DE SCHAUNSEE, RODOLPHE M. First preliminary report on the results of the second Dolan expedition to west China and Tibet: Two new birds from Tibet. Proc. Acad. Nat. Sci. Philadelphia, 89: 339-340, Oct. 20, 1937.—New: *Crossoptilon*

- crossoptilon dolani* from Jyekundo, southern Kokonor, and *Charadrius mongolus schäferi* from about one hundred miles north of Jyekundo.
- DE VRIES, TSJEARD G. De Midden-Europese goudpluvier, *Charadrius a. apricarius* L., als broedvogel in Friesland. *Limosa*, 10: 118-119, Sept. 1937.—Breeding of this plover in Holland.
- DINELLI, LUIS M. La proteccion de las aves. *El Hornero*, 6: 483-488, Sept. 1937.—Brief notes on birds and mammals as predatory species affecting bird life.
- DIXON, JAMES B., AND DIXON, RALPH E. Nesting of the Western Goshawk in California. *Condor*, 40: 3-11, 6 figs., Jan. 1938.—Nesting is in first week of May; three eggs is usual number laid. During the period the young were in nest, the food supplied was entirely mammals.
- DUBOIS, DAWES. The McCown Longspurs of a Montana prairie. *Condor*, 39: 233-238, text-fig. 63-65, Nov. 1937.—The migration, song-flight, and nesting are described. Protracted rainstorms and late spring snows are the factors most destructive of the young.
- DUMONT, PHILIP A. Franklin's Gulls nesting on Sand Lake Refuge, South Dakota. *Oologist*, 55: 3-5, Jan. 1938.
- DUNAJEWSKI, ANDRZEJ. Bemerkungen über einige mittelasiatische Vögel. *Acta Ornith. Musei Zool. Polonici*, Warsaw, 2: no. 6, 69-86, Aug. 28, 1937.—Notes on various birds from Transcaspia and Ferghana, with description of a new rail, *Porzana pusilla bareji*, from Gultscha, Ferghana.
- DUNAJEWSKI, ANDRZEJ. Ein Beitrag zur Systematik der Rabenvögel (Corvidae). *Acta Ornith. Musei Polonici*, Warsaw, 2: no. 9, 145-156, Jan. 31, 1938.—New: *Coloeus monedula sophiae* from Dolsk.
- DUNAJEWSKI, ANDRZEJ. Zwei neue Vogelformen. *Acta Ornith. Musei Zool. Polonici*, Warsaw, 2: no. 10, Jan. 31, 1938.—New are: *Gallinula chloropus lucida* and *Sylvia borin kreczmeri* of Poland, paler than typical birds from the British Isles and France respectively.
- DUNAJEWSKI, ANDRZEJ. Die geographischen Formen der Dorngrasmücke (*Sylvia communis* Lath.). *Acta Ornith. Musei Zool. Polonici*, Warsaw, 2: no. 12, 229-238, Feb. 26, 1938.—Six races are recognized in Europe east to Turkestan, including a new race, *Sylvia communis hoyeri*, from Poland.
- DUPOND, CH. Oeuvre du baguage des oiseaux en Belgique. *Le Gerfaut*, pt. 2, 27: 53-102, 1937.—Returns of birds banded in Belgium in 1936 are listed.
- ERRINGTON, PAUL. What is the meaning of predation? *Smithsonian Rept. for 1936*, 243-252, 1937.—"Whether taken by predators or otherwise lost, the surplus must disappear; population sooner or later coincides with carrying capacity."
- ESTEN, SIDNEY R. Birds of Jay County, from records of Hal Coffel. *Audubon Year Book*, Indiana Audubon Soc., 15: 12-19, 1937.
- EVANS, CHARLES. A Bittern's courtship actions. *The Flicker* (Minneapolis), 9: 12, Dec. 1937.
- GLEGG, WILLIAM E. Birds in Middlesex. *British Birds*, 31: 297-301, Feb. 1, 1938.
- GRANT, C. H. B., AND MACKWORTH-PRAED, C. W. (1) On the type-locality of *Cypselus barbatus* (*Micropus apus barbatus*) P. L. Sclater, *Proc. Zool. Soc. Lond.* 1865, p. 599; (2) On some East African swifts. *Bull. British Ornith. Club*, 58: 49-51, Jan. 5, 1938.
- GREAVES, R. H., AND TREGENZA, L. A. The Nile Valley Sunbird (*Nectarinia metallica*) in Egypt. *Oologists' Record*, 17: 79-83, Dec. 1937.—During the last twenty years the breeding range of this bird has been extended northward in the Nile Valley nearly two hundred miles at least to Kena, and it has been seen at Cairo,

doubtless as a result of introduction of its favorite flowering plants, a calendar of which is given showing on what species it depends at different times of year.

GREGG, H. R. Birds of Rocky Mountain National Park. Rocky Mt. Nature Ass'n, Publ. no. 2, 80 pp., illustr., Mar. 1938.—A convenient list of birds hitherto found to occur within the bounds of this national park in Colorado. It is based on records filed in the offices of the Park and comprises some 184 species and subspecies, including the introduced Ring-necked Pheasant and House Sparrow, neither of which appears to be common. For each form the Latin and English names are given, followed by a brief statement of relative abundance, times of occurrence, nesting data and other notes of interest. It is, in effect a revised edition of the similar list published in 1930 by Babcock and Ashton and should prove helpful to the many tourists and other visitors wishing to know what birds may be looked for in the region. While not intended as a guide-book or manual, it includes a brief artificial key to the species based on the one previously issued by Babcock, in which the birds are grouped in accordance with their characteristic habitats. A number of illustrations from photographs or drawings add to its attractiveness besides facilitating identifications. There is also a bibliography of important references to literature that concern the Park and a directory of persons to whom bird records are chiefly due. The nomenclature follows carefully that of the A. O. U. 'Check-list' even to its misprints (the double 'i' in Accipitridae and Micropodiformes), although the family heading 'Falconidae' is inadvertently omitted and there are too many misspellings of Latin names.

Among other interesting points, is the vertical migration of Pine Grosbeak, Brown-capped Rosy Finch, and Gray-headed Junco, birds which in winter move down to lower levels from their alpine or subalpine breeding grounds. The American Pipit, which arrives at lower levels after mid-April and reaches its summer home above timber-line in May, is sometimes driven back to lower elevations in large flocks by storms occurring as late as mid-June.—G. M. A.

GROTE, H. [*Anthus nicholsoni chapini* subsp. nova.] *Alauda*, (3) 9: 205, 1937.—A dark race of this pipit from the Bamenda highlands, Cameroons.

GUGGISBERG, C. A. W. Auf der Vogelinseln von Pembrokeshire, 26. April–2. May 1937. Ornith. Beobachter, L'Ornithologiste, 34: 192–203, 4 text-figs., 3 pls. 1937.—An account of the bird life on these bird sanctuaries off the coast of Wales. Excellent photographs of nesting Gannets.

GUGGISBERG, C. A. W. Beobachtungen am Eisvogelneest. Ornith. Beobachter, L'Ornithologiste, 35: 7–10, fig., Oct. 1937.

GUGGISBERG, C. A. W. Der Durchzug der Limicolenarten am Fanelstrand (Albert Hess-Reservation). Ornith. Beobachter, 35: 17–33, 1937.—Shorebird migration at Neuenberg Lake, Germany.

GUGGISBERG, C. A. W. Der Durchzug der Limicolenarten am Fanelstrand. Ornith. Beobachter, L'Ornithologiste, 35: 49–54, fig., Jan. 1938.

GUNTHER, R. T. The Oxford Dodos. Bird Notes and News, London, 17: 141–142, 1937.—History of the mounted Dodo formerly at Oxford, of which the head and a foot remain. The museum also has a number of bones from Mauritius.

GWYNNE, A. J. Notes on the Green Catbird [*Ailurodoeus crassirostris*]. The Emu, 37: 76–78, Oct. 1, 1937.—This and the Spotted Catbird are not bower-builders in spite of such reports.

HAINARD, ROBERT. Notes ornithologiques. Alpes valaisannes et vallée du Rhone. 1932–1937. Arch. Suisses d'Ornith., 1: 391–403, 3 figs., Oct. 1937.

HAMER, W. H. The hummingbirds of Jamaica. Bird Notes and News, London,

- 17: 172-176, 4 text-figs., 1937.—Habits of the Streamer-tailed Hummingbird (*Aithurus*).
- HAMPE, HELMUT. Ueber Nestbau und Geschlechtsunterscheide der *Agapornis*-Arten. Journ. f. Ornith., **86**: 107-112, 4 text-figs., Jan. 1938.—On the nesting in captivity of species of these parrots.
- HARKNESS, WILLIAM J. K. Notes on introduced Capercaillie. Canadian Field-Nat., **52**: 43, Mar. 1938.—Eight birds were released on Georgian Bay shore between Midland and Parry Sound in 1903, but were not heard of in later years.
- HEDEMANN, H. VON. Ueber die winterliche Nahrung der Nonnengans (*Branta leucopsis*). Ornith. Monatsber., **45**: 204, Dec. 13, 1937.—In the region of Hamburger Hallig the Barnacle Geese that regularly winter in the region have been found to depend for winter food chiefly if not altogether upon the grass, *Festuca thalassica*, seldom taking eel-grass if at all.
- HEINROTH, O. Die Balz des Bulwersfasans, *Lobiophasis bulweri* Sharpe. Journ. f. Ornith., **86**: 1-4, pl. 1, 2 text-figs. Jan. 1938.—A fine colored plate illustrates the striking display of Bulwer's Pheasant as seen in the Berlin Zoological Gardens. The contrastingly pure-white tail is spread to its utmost, and the bright blue lappets of the head are inflated to form two long narrow projections, one hanging downward, the other extending back from the head. At the height of this action, the bird utters an explosive *gack*. The mechanism of the inflation is described in a succeeding article by A. SCHNEIDER, who from an anatomical examination, concludes that the lappets are distended by the pressure of blood supply with which they become turgid.
- HIBBERT-WARE, ALICE. Report of the Little Owl inquiry. 1936-37. British Birds, **31**: 249-264, pls. 5-10, Jan. 1, 1938.—Gives the result of pellet analysis, particularly with regard to insects taken. The Little Owl is found to feed largely on insects at all times of year; the dominant species eaten at any time are usually those then most abundant.
- HINDWOOD, K. A. The Black-chinned Honeyeater. The Emu, **37**: 143, pl. 25, Oct. 1, 1937.
- HOLDOM, M. W. Albino White-crowned Sparrow (*Zonotrichia leucophrys nuttallii*). Canadian Field-Nat., **52**: 61, Apl. 1938.—At Surrey Centre, British Columbia; the general color was cream, but the black crown with its white median stripe was present.
- HOogerWERF, A. Uit het leven der witte ibissen, *Threskiornis aethiopicus melanocephalus*. Limosa, **10**: 137-146, pl. 7-14, Dec. 1937.—A careful account of the nesting of this White Ibis in Java. Often the nests of a breeding colony are so close together in bare trees as to form an almost continuous platform. The young feed by inserting the bill in that of the parent. Many excellent photographs of adults and young.
- HOogerWERF, A., AND SICCAMA, G. F. H. W. REGNERS HORA. De avifauna van Batavia en omstreken. Ardea, **26**: 116-159, pls. 14-26, Dec. 1937.—The second installment of an annotated list of birds of Batavia in Java, covering the ibises, herons, cormorants, hawks and owls, with exceptionally fine photographs of various species at their nests.
- HUGUES, ALBERT. Contribution à l'étude des oiseaux du Gard, de la Camargue et de la Lozère. Alauda, (3) **9**: 151-209, 1937.—An annotated list of the birds of the Camargue and adjacent regions, with a bibliography.
- HUSAIN, M. AFZAL AND HEM RAJ BHALLA. Some birds of Lyallpur and their food. Journ. Bombay Nat. Hist. Soc., **39**: 831-842, December 1937.—The studies reported

- involved, in most instances, examination of stomach contents. The account is remarkably condensed, results from analyses of the food of 262 House Sparrows, for example, being given in five lines. In all, however, considerable definite information is given on the occurrence, food, and economic status of ninety-three species of birds of a district, the avifauna of which has altered and increased following irrigation.—W. L. M.
- IREDALE, TOM. J. R. & G. Forster, naturalists. The Emu, **37**: 95-99, Oct. 1, 1937.—Notes on the history of J. R. Forster's writings, with the resuscitation of several hitherto overlooked names for Australian birds.
- ISENBURG, F. R. Albino Robin. Oölogist, **54**: 103, Sept. 1937.—A pure-white Robin with pink eyes was secured in East Peoria, Illinois, that was being attacked by other normally colored Robins. The bird later died of its injuries and was preserved.
- JACOBS, J. WARREN. On the reasoning instinct of the Tufted Titmouse (*Baeolophus bicolor*). Oölogist, **55**: 6-7, Jan. 1938.—A sitting bird covers itself with nest material when its nest cavity is opened.
- JENKS, RANDOLPH. A new subspecies of Pine Grosbeak from Arizona with critical notes on other races. Condor, **40**: 28-35, text-fig. 13-17, Jan. 1938.—Describes *Pinicola enucleator jacoti* from base of Baldy Peak, Apache County, Arizona, where it is restricted to a boreal 'island' in the White Mountains.
- JOHNSON, PERRY FRANK. Notes on birds of northeastern Indiana. Audubon Year Book, Indiana Audubon Soc., **15**: 46-48, 1938.
- JONES, F. M. Weather prophets and woodpeckers. Oölogist, **55**: 10-12, Jan. 1938.—An autumnal flight of Red-headed Woodpeckers in the Cumberland Mountains of Virginia.
- JOURDAIN, F. C. R. [The European White Stork.] Bull. British Ornith. Club, **58**: 38-39, Jan. 5, 1938.—With comment by D. A. Bannerman, p. 39-41, and others.
- JOURDAIN, F. C. R. Erythristic eggs of the Rook. *Corvus f. frugilegus* (L.). Oölogists' Record, **17**: 89-90, pl. 1 (col.), Dec. 1937.—Various records of erythristic Rook's eggs, and a set from Ireland figured.
- JOURDAIN, F. C. R. Messrs. C. G. & E. G. Bird's East Greenland collections. Oölogists' Record, **17**: 90-91, Dec. 1937.—Account of a collection made at Myggbukta, Mackenzie Bay, among others, five sets of the Knot, three of which were of four, two of three eggs. "The supposed eggs of the Knot from Iceland in the Ottosson collection at Stockholm are not, in my opinion, authentic, nor is the single egg from West Greenland (Seebohm collection) in the British Museum, and the eggs in the Tring collection from Labrador and the Varanger Fjord (!) are obviously wrongly identified."
- JUNGE, G. C. A. Resultaten van het ringonderzoek betreffende den vogeltrek, ingesteld door het Rijksmuseum van Natuurlijke Historie te Leiden, XXIV. Limosa, **10**: 98-108, Sept. 1937.—Yearly report on returns from banded birds carried on by the Leiden Museum.
- JUNGE, G. C. A. Resultaten van het ringonderzoek betreffende den vogeltrek, ingesteld door het Rijksmuseum van Natuurlijke Historie te Leiden, XXIV (slot). Limosa, **10**: 151-162, Dec. 1937.—Conclusion of the list. In all 22,901 birds were banded.
- JUNGE, G. C. A. *Tringa totanus totanus* L. de in Nederland broedende subspecies van de tureluur. Limosa, **10**: 166, Dec. 1937.—The breeding bird of Holland is the typical race.
- KATE, TEN. Ornithologie van Nederland 1937, 2e mededeling. Limosa, **10**: 108-117, Sept. 1937.—Second instalment of a list of Holland's birds with notes.

- KATE, TEN. Ornithologie van Nederland 1937, 3e mededeling. *Limosa*, 10: 163-166, Dec. 1937.—Third part of list of Holland's birds.
- KATE, TEN. Terugvondsten van in het buitenland geringde vogels, 9. *Limosa*, 10: 167-170, Dec. 1937.—Further list of returns from birds banded in Holland.
- KOCH, NORMA. Hawaii's early treatment of birds. Audubon Year Book, Indiana Audubon Soc., 15: 28-32, 1937.
- KEYSERLINGK, ALEXANDER GRAF. Beobachtungen an Uferschwalben (*Riparia riparia*). Ornith. Monatsber., 45: 185-188, 13 Dec. 1937.—Overtaken in early September by inclement weather, storm and cold, large numbers of Bank Swallows migrating along the coast of Estlands, took shelter in a dove-cote in one mass, and a second solid mass gathered for the night on the side of a stall. The entire mass in each case huddling together for warmth, seemed to remain a unit and could be shoved to one side or finally pushed into a box, whence many were removed for banding. The birds were warmed and later released after experiments in inducing them to take food.
- KRÄTZIG, H. Histologische Untersuchungen zur Frage der Struktur- und Farbveränderungen an Federn nach künstlicher (Thyroxin) Mauser. Roux' Arch., 137: 86-150, 36 fig., 1938.—An important contribution toward the study of the influence of thyroxin on the growth and pigmentation of feathers. Most differences from the normal molt can be explained on the basis of the "speed up" of all physiological and growth processes in the feather germ. The melanin (pigment) is produced by giant epidermal cells. Again it is stated, as indeed by most workers with birds, that eumelanin (the black pigment) and phaeomelanin (the brown pigment) are independent pigments, while workers on mammals explain these color differences by different pigment concentrations. A reduction or disappearance of the lipochromes is caused by the increased metabolism.—E. MAYR.
- LACK, DAVID, AND LOCKLEY, R. M. Skokholm bird observatory homing experiments. 1. 1936-1937. Puffins, Storm-petrels and Manx Shearwaters. British Birds, 31: 242-248, Jan. 1, 1938.—A summary of experiments in releasing these birds at varying distances from their nesting burrows, after banding. The presence of an egg or a chick furnished a motive for their return. The farthest distance to which a bird was taken was 930 miles in a direct line, in the case of a shearwater that was carried to Venice. The bird was retaken in two weeks. If the bird returned by sea, the distance traversed must have been about four times as great.
- LASKEY, AMELIA R. Bird banding brevities—no. 12. The Migrant, 9: 10-11, Mar. 1938.—At Nashville, Tennessee, a number of interesting returns of banded birds were secured in autumn of 1937, including Gambel's Sparrow, and a White-crowned Sparrow that had spent four consecutive winters there, two Field Sparrows each now about five years old and a Junco about five and a half years old.
- LEACH, E. P. Recovery of marked birds. British Birds, 31: 302-308, Feb. 1, 1938.—List of 1937 British recoveries.
- LEWIS, HARRISON F. Notes on birds of the Labrador peninsula in 1936 and 1937. Canadian Field-Nat., 52: 47-51, Apl. 1938.—Among various rarer species, an American Egret is noted near Harrington Harbour, May 12, 1937.
- LINSDALE, JEAN M. Geographic variation in some birds in Nevada. Condor, 40: 36-38, Jan. 1938.—Intergradation is demonstrated between *Aphelocoma californica* and *woodhousei*, so that the latter is regarded as a race of the former. A pale chickadee, *Penthestes atricapillus nevadensis*, is named as new from Salmon River, Elko County, Nevada.
- LIPPERT, O. H. Notes on the birds of Crawley, Perth, in the early 'nineties. The Emu, 37: 133-134, Oct. 1, 1937.

- LOW, G. CARMICHAEL. The supposed races of the Grey- or Black-bellied Plover (*Squatarola squatarola*). *Ibis*, (14) 2: 154-158, Jan. 1938.—A comparison of British, American and eastern birds sustains American usage in not recognizing an American subspecies.
- MALTY, FRED. Some experiences with the Pacific Night Hawk. *Oölogist*, 55: 16-20, Feb. 1938.—Habits near Seattle, Washington.
- MATHEWS, G. M. [A new name for the British Long-tailed Tit.] *Bull. British Ornith. Club*, 58: 44, Jan. 5, 1938.—*Aegithalus caudatus rosaceus*.
- MATHEWS, GREGORY M. A new shearwater for Western Australia. *The Emu*, 37: 114-116, pl. 16, Oct. 1, 1937.—*Puffinus leptorhynchus* Mathews.
- MATHEWS, GREGORY M. Remarks on Prions. *The Emu*, 37: 118-121, Oct. 1, 1937.
- MATHEWS, GREGORY M. Key (dichotomous antithesis) of the storm-petrels. *The Emu*, 37: 136-143, Oct. 1, 1937.—New subgenus, *Fregolla*, for *Fregetta melanoleuca*.
- MCMAMARA, ELLIS. Birds of the blackberries. *The Emu*, 37: 99-102, Oct. 1, 1937.—A brief account of Australian birds that have adapted themselves to living in the thickets of introduced blackberry.
- MAYR, ERNST, AND GREENWAY, J. C., JR. Forms of *Mesia argenteauris*. *Proc. New England Zool. Club*, 17: 1-7, Mar. 24, 1938.—In addition to the typical race from Sikkim and southwestern Yunnan, and *M. a. tahananensis* from peninsular Siam and the Malay peninsula, two new races are recognized: *M. a. vernayi* from Upper Chindwin River, and *M. a. galbana* from Mt. Angka, northern Siam.
- MEIKLEJOHN, R. F. Determinism and norm in bird biology. *Arch. Suisses d'Ornith.*, 1: 414-416, Oct. 1937.—On factors possibly affecting the number of eggs to a set.
- MILLER, ALDEN H. Biotic associations and life-zones in relation to the Pleistocene birds of California. *Condor*, 39: 248-252, Nov. 1937.—Comparison of the known flora and small-bird fauna of the three Pleistocene stations, Rancho La Brea, Carpinteria, and McKittrick, in California with those of the present day indicates that formerly "southern California resembled northern Lower California in abrupt contrasts, yet had certain northern components not now found in Lower California. Northern California was of more boreal aspect."
- MILLER, R. S. The Spotted Catbird [*Ailuroedus melanotus*]. *The Emu*, 37: 73-76, pl. 13, Oct. 1, 1937.
- MOFFITT, JAMES. Seventh annual Black Brant census in California. *California Fish and Game*, 23: 290-295, Oct. 1937.
- MOORE, ROBERT T. Unusual birds and extension of ranges in Sonora, Sinaloa and Chihuahua, Mexico. *Condor*, 40: 23-28, Jan. 1938.
- MOREAU, R. E. [A new race of the Bar-throated Warbler.] *Bull. British Ornith. Club*, 58: 48-49, Jan. 5, 1938.—*Apalis murina fuscicularis* from Taita Hills, Kenya Colony.
- MOREAU, R. E., AND SCLATER, W. L. The avifauna of the mountains along the Rift Valley in north central Tanganyika Territory (Mbulu district).—Part II. *Ibis*, (14) 2: 1-32, Jan. 1938.—The concluding part of this list of upland birds with brief annotations. The European Blackcap, which winters commonly, is a frequent singer during the winter months. The author suggests, from the fact that he found the gonads well developed in an October and a January bird, that they do not shrink in this season.
- MORRISON, ALASTAIR. Notes on the birds of north-east Iceland. *Ibis*, (14) 2: 129-136, text-fig. 1, Jan. 1938.—This corner of Iceland has been less investigated than other parts. The Iceland Falcon has decreased in recent years. The Iceland

- Whooper Swan is still fairly common in Melrakka Sietta. Here, too, the Eider is abundant. Nine Eider Duck farms yield about five hundred pounds of cleaned down annually. Figures plotted for yields of one farm since 1910 show a steady decline in production, since 1928.
- MORRISON-SCOTT, T. C. S. A note on the distribution of the two shrews found in Jersey. *Journ. Animal Ecol.*, 6: 284-285, 2 tables, Nov. 1937.—The author's interest in the contents of three lots of Barn Owl pellets from Jersey was evidence as to habitat preferences of shrews. As complete lists of the animals represented in the pellets are given, they make a welcome contribution to knowledge of food habits of the Barn Owl, a cosmopolitan species, data on the diet of which, so readily obtained by pellet analysis, probably already exceed those for any other bird. From a theoretical point of view, the findings are of interest as shrews and moles, supposedly "protected" animals, amounted to a third of all the organisms taken. Small rodents, as usual, were prominent and birds made up 15 per cent of the total number of captures, most of them being English Sparrows.—W. L. M.
- MORRISON-SCOTT, T. C. S. Experiments on colour-vision in the Satin Bowerbird (*Ptilonorhynchus violaceus*), with other observations. *Proc. Zool. Soc. London*, 107 (ser. A): 41-49, pl. 1, 1937.—The distinct choice of blue and greenish-yellow objects for decoration of its bower may be correlated with the fact that the eyes of the female are blue while greenish yellow matches the tint of her body feathers and underside of the wings and hence these colors are attractive to the male.
- MURPHY, ROBERT CUSHMAN. Dark skies—a scientific voyage in a 38-foot boat along the rainy Pacific shores of Colombia, the least-known continental seacoast in the world. *Natural History*, 41: 164-178, illustr., Mar. 1938.—An important discovery was that the main wintering ground of the Black Tern is off the western shores of Colombia. An interesting account of the winter conditions and bird life of the region.
- MURRAY, J. J. Some breeding birds of Letcher County, Kentucky. *Kentucky Warbler*, 14: 1-4, Feb. 1938.
- NAUMBURG, ELSIE M. B. Studies of birds from eastern Brazil and Paraguay, based on a collection made by Emil Kaempfer. *Bull. Amer. Mus. Nat. Hist.*, 74: 139-205, Dec. 31, 1937.
- NICHOLS, J. T. The European Starling's relation to native species. *Univ. of N. Y. Bull. to Schools*, 24: 129-130, Mar. 15, 1938.
- NICOL, A. C. On the nest of the Sora Rail (*Porzana carolina* Linn.). *Canadian Field-Nat.*, 52: 55-57, 2 figs., Apl. 1938.—A Sora covers its eggs with leaf scraps when leaving the nest; locality not given.
- NIETHAMMER, GÜNTHER. Ueber den Kropf der männlichen Grosstrappe. *Ornith. Monatsber.*, 45: 189-192, Dec. 13, 1937.—The Great Bustard of Europe, is found to have in the male a secondary enlargement of the crop, which develops as an out-pocketing as the bird matures. It is the expansion of this that produces the swelling of the throat when the bird displays. No other strictly comparable structure is known in birds.
- NIETHAMMER, G. Über die Beziehungen zwischen Flügelänge und Wanderstrecke bei einigen europäischen Singvögeln. *Arch. f. Naturg.*, new ser., 6: 519-525, 1937.—Author quotes considerable material to show that the increase of wing-length with latitude, which is observed in so many birds, is frequently not an index of larger body size, because the weights of northern birds are not correspondingly larger. It rather seems that there is a correlation between wing-length and length of migration route.—E. MAYR.

- NORTHWOOD, J. D'ARCY. Notes on Hawaiian bird life. *Bird Notes and News*, London, 17: 152-153, 1937.—A short account of the Hawaiian avifauna. "To-day there are probably only five species of the native perching birds to be found on Oahu." Several exotic species have become naturalized through introduction, including the American Cardinal, the Brazilian Cardinal and the American Mockingbird.
- ORFILA, RICARDO N. Los Psittaciformes argentinos. *El Hornero*, 6: 365-382, pl. 3, Sept. 1937.—Continuation of a review of the Argentine parrots.
- OVERINGTON, R. BRUCE. A trip to the tropics. *Oölogist*, 54: 105-109, Sept. 1937.—An account of the discovery of the nest of a Harpy Eagle, and the collecting of the adult female and her three eggs near Turrialba, Central America.
- PAGET-WILKES, A. H. Notes on the breeding of some species in north-eastern Uganda. *Ibis*, (14) 2: 118-129, Jan. 1938.—Among other birds noticed, the barbet, *Trachyphonus darnaudii*, is remarkable in that it digs a nesting burrow vertically in sandy soil to a depth of two or three feet.
- PAYN, W. A. Spring migration at Tangier. *Ibis*, (14) 2: 33-38, Jan. 1938.—In tabular form are given migration dates of spring arrivals and their departure northward at Tangier. Males usually arrived about ten days ahead of females. "In no case were the gonads of passage-migrants at all developed on arrival; nor do birds sing on arrival, except, possibly, the Oriole."
- PAYN, W. H. Some notes on the spring migration in Malta and Gozo. *Ibis*, (14) 2: 102-110, Jan. 1938.—"Evidently rather than make the long sea-crossing direct from the Libyan coast, migrants follow the coastline round till they reach Tunis, whence the journey via Malta and Sicily to the Italian peninsula is a comparatively easy one."
- PEASE, H. J. R. Birds of Hailuoto, Finland. *Ibis*, (14) 2: 38-65, Jan. 1938.—An annotated list of birds seen on a visit to this island near the head of the Gulf of Bothnia. Several species, as Starling, Rustic Bunting (a recent colonist), Common Buzzard, Lapwing, Curlew, Great Black-backed Gull, have increased in recent years, while others, as Raven, House Sparrow, Osprey, Grey Lag-Goose, Sclavonian Grebe, Razorbill, Black Guillemot, Common Crane, Capercaillie, Willow Grouse, have decreased.
- PEREYRA, JOSÉ A. Viaje al paraíso de nuestras aves acuáticas. *El Hornero*, 6: 466-476, 3 text-figs., Sept. 1937.—Account of a visit to the breeding grounds of many aquatic birds near General Lavalle, Argentina.
- PEREYRA, JOSÉ A. Miscelanea ornitológica. *El Hornero*, 6: 431-449, 3 text-figs., Sept. 1937.—The notes include new bird records for Buenos Aires province; Swainson's Hawks feeding on locust swarms, habits of the parrot, *Myiopsitta monacha*, a probable new species of *Sicalis*, provisionally named *Sicalis striata*; albinism in various birds, and a correction of synonymy whereby a specimen referred by Arribalzaga to *Merula maranonica* is shown to be *Turdus amaurochalinus*.
- PETERS, JAMES L., AND GRISCOM, LUDLOW. Geographical variation in the Savannah Sparrow. *Bull. Mus. Comp. Zool.*, 80: 443-478, 1 pl., Jan. 1938.—On the basis of a very large series of specimens representing the Savannah Sparrows of North America, the authors have critically examined the various geographic forms of this difficult group with many interesting results. They for the first time point out that the Ipswich Sparrow, hitherto given specific rank, is after all but a geographic race of the Savannah Sparrow, differing in its pale coloration in correlation with the sandy nature of its breeding ground on Sable Island. The eastern *Passerculus sandwichensis savanna* is shown not to be a breeding bird in South Carolina, as

- believed by Figgins, and the supposed race *bradburyi*, described by him, is thus a synonym. The dark race of the Labrador east coast and Newfoundland is upheld as *labradorius*, although the determination of migrant birds from farther south is often difficult in certain stages of wear. The bird from the west side of Hudson Bay, southward east of the prairies to northern Minnesota, is distinguished as a new race, *P. s. oblitus*, while the stout-billed bird of the Alexander Archipelago and adjacent mainland, Alaska, is separated as *P. s. crassus*. Other western races are carefully defined and the migration periods, summer and winter ranges are carefully worked out for all the subspecies. While the authors have not attempted to review the large-billed forms of the west coast, these are included with brief comment, for the sake of completeness, on the basis of previous study by Californian ornithologists. The colored plate brings out the subtle points of difference between the races *P. s. savanna*, *P. s. nevadensis*, and *P. s. labradorius*.
- PETERSON, THEODORE. The Parasitic Jaeger. Jack-pine Warbler, 16: 6-8, Apl. 1938.—Observed at St. Joe, Michigan, in 1922.
- PINNEY, M. E., AND MACNAUGHTON, J. F. Some early bird records of Wisconsin and neighboring territory to the west and north (1896-1900) and of Indiana (1876-1877). Trans. Wisconsin Acad. Sci., Arts and Lett., 30: 87-116, 1937.
- POGOSSIANZ, H. Karyotypes of some representatives of Passeres (*Passer domesticus* L., *Coloeus monedula* L., *Turdus pilaris* L.). Biol. Zhurnal, 6: 665-688, 7 fig., (1937).—Russian, with English summary. The chromosome sets of the three species are quite different. The total number of chromosomes varies in the sparrow from 40 to 48, in the Jackdaw from 56 to 67 and in the Thrush from 74 to 81, a variation almost exclusively caused by the "small" chromosomes. The sex-chromosomes were found in Jackdaw and Thrush, differed considerably. The suggestion that the differences between the three species pointed to a polyphyletic origin of the Passeres is hardly to be taken seriously in view of the differences of the chromosome sets of the various species of the one genus *Drosophila*.—E. MAYR.
- POTZIG, P. Der Frühwegzug des Kiebitzes (*Vanellus vanellus* L.) unter Berücksichtigung anderer Limicolen. Seine Physiologie und Bedeutung für das Problem Zugtriebauslösung. Journ. f. Ornith., 86: 123-164, pls. 10-11, Jan. 1938.—Relation of migratory urge to state of the gonads and the colloid-secreting glands.
- POTZIG, P. Zum Zuge der Zwergmöwe, *Larus minutus* Pall., im Gebiet der Kurischen Nehrung. Limosa, 10: 147-151, Dec. 1937.—Migration of the Little Gull in the Kurische Nehrung of East Prussia. As in the case of the Black-headed Gull, the immatures of the previous year are later in their spring arrival than the adults.
- RÄBER, JOH. Rotmilanzug im Fricktal. Ornith. Beobachter, 35: 39-41, map, 1937.—Migration of the Kite in Germany.
- REED, WILLIE RUTH. A female Cardinal fights her reflection. The Migrant, 9: 17-18, Mar. 1938.
- RENSHAW, GRAHAM. Some extinct birds. Bird Notes and News, London, 17: 161-162, pl., 1937.—A brief account of the 'Corbeau Indien' with a plate reconstructed from De Bry's and Harmanszoon's figures of this extinct parrot of Mauritius.
- ROOKE, K. B. Unusual reproductive behaviour: the reactions of a male Bishop-bird in non-breeding plumage to nestling Canaries. Ibis, (14) 2: 147-149, Jan. 1938.—A male bird in an aviary constantly fed young Canaries and removed droppings from the nest. The female Canary at first resented the intrusion though the male was more tolerant, and eventually the stranger was accepted by both and took a very active part in the feeding and sanitation, while at the same time he gave up attempts at nest building though he continued to sing.

- ROBERTS, N. L. Some ecological aspects of bird life. Part II. The Emu, **37**: 150-156, Oct. 1, 1937.
- ROBINSON, H. W. First Fulmar Petrel to hatch on the Bass Rock. Scottish Nat., 172, 1937.
- ROBINSON, H. W. Young Gannets with malformed beaks. Scottish Nat., 172, 1937.—Two with crossed mandibles on Bass Rock.
- RYSGAARD, G. N. Afoot in northern Minnesota. An informative narrative of the adventures of four enthusiastic bird-students on vacation. The Flicker (Minneapolis), **9**: 1-5, 2 text-figs., Dec. 1937.
- RYSGAARD, G. N. 1937 Minnesota nesting records. The Flicker (Minneapolis), **9**: 7-12, Dec. 1937.
- SANDLAND, P. T. Notes on birds on Pelsart Island. The Emu, **37**: 144-149, pl. 26, Oct. 1, 1937.
- SAUER, E., AND SEILER, P. Beobachtungen an einem Turmfalkenhorst. Ornith. Beobachter, **35**: 33-39, 1937.—A detailed series of observations during a day at a Peregrine Falcon's nest.
- SCANLON, W. N. Les oiseaux du Taimir. Le Gerfaut, **27**: 108-120, 1937.—Description of habitats and characteristic species of the tundra of Taimyr (continuation).
- SCHÄFER, ERNST. Third preliminary report on the results of the second Dolan expedition to west China and Tibet: Four new birds from Tibet. Proc. Acad. Nat. Sci. Philadelphia, **89**: 385-386, Nov. 5, 1937.—New: *Hirundo daurica tibetana* from one hundred miles north of Jyekundo; *Lophobasiliscus elegans meissneri*, from south of Litang; *Passer montanus maximus* from Jyekundo; *Petronia petronia jyekundensis* from Jyekundo.
- SCHENK, JAKOB. Der Zug des Kranichs im historischen Ungarn. Journ. f. Ornith., **86**: 54-58, 2 text-figs., Jan. 1938.—The migration of the Crane (*Grus grus*) in Hungary is described. The species rarely winters, and in one region, occurs in summer, where the herdsmen sometimes hunt molting birds that are unable to fly.
- SCHNEIDER, A. Bau und Erektion der Hautlappen von *Lophophanes bulweri* Sharpe. Journ. f. Ornith., **86**: 5-8, Jan. 1938.—Erection of the skin lappets during display of Bulwer's Pheasant results from increased blood pressure due to the contraction of the muscles of the blood vessels which at the same time cut off the local circulation.
- SCHNEIDER, AD. Die Vogelbilder zur Historia Naturalis Brasiliae des Georg Marcgrave. Journ. f. Ornith., **86**: 74-106, 4 text-figs., Jan. 1938.—A reexamination of the figures on which various names of South American birds are based results in various reidentifications and consequent changes in names.
- SCLATER, W. L. The late Lord Rothschild. Ibis, (14) **2**: 111-118, pl. 2, Jan. 1938.—A biographical sketch with portrait and bibliography.
- SERVENTY, D. L. Local migration in the Perth district, Western Australia. The Emu, **37**: 90-94, Oct. 1, 1937.
- SERVENTY, D. L. *Calamanthus* forms in the Shark's Bay district, Western Australia. The Emu, **37**: 103-105, Oct. 1, 1937.
- SHAW, TSEN-HWANG. Einige Bemerkungen zum Oberschenkelknochen des fossilen Strausses *Struthio anderssoni* Lowe von Chou Kou Tien in Nord-China. Ornith. Monatsber., **45**: 201-202, Dec. 13, 1937.—In a table are given the comparative measurements of the femur of living forms of Ostrich as a contrast with that of the extinct Mongolian species, the total length of which is 355 mm.
- SHEPPARD, R. W. Rare gulls at Fort Erie on the Niagara River. Canadian Field-Nat., **52**: 61-62, Apl. 1938.—Kumlien's Gull identified January 29, 1937, and on September 18, 1897, a Laughing Gull in transition plumage.

- SICK, HELMUT. Zur Frage der Kleingefiederstruktur von *Agapornis*. Journ. f. Ornith., **86**: 113-122, 4 text-figs., Jan. 1938.—Feather structure.
- SLOAN-CHESSER, S. Bird-nesting on Lancashire Moors. Oölogists' Record, **17**: 83-88, Dec. 1937.
- SNYDER, L. L. An extralimital record of the Magpie in Ontario. Canadian Field-Nat., **52**: 45, Mar. 1938.—One taken in early spring, 1937, near Mammamattawa, Cochrane district, is now in the Royal Ontario Museum of Zoology.
- SNYDER, L. L. Ontario and its avifauna. Contrib. Royal Ontario Mus. Zool., no. 12, pp. 1-6, 2 text-figs., 1938.
- SPROT, G. D. Migratory behavior of some Glaucous-winged Gulls in the Strait of Georgia, British Columbia. Condor, **39**: 238-242, text-fig. 66 (map), Nov. 1937.—Banded birds show the usual heavy mortality up to three years of age. Immature birds tend to make the longest autumnal flights from the colony where they were hatched.
- STANFORD, J. K., AND TICEHURST, CLAUD B. On the birds of northern Burma.—Part I. Ibis, (14) **2**: 65-102, pl. 1 (map), Jan. 1938.—This forested triangle of northeastern Burma is described in its various topographical subdivisions, and the first part of a list of its birds is given. Nine species are listed as new to the Indian fauna. Critical remarks are made as to the generic division of the Laughing Thrushes, *Garrulax* and its relatives.
- STEGEMANN, B. Ueber die Flügelhaltung von *Archaeornis* in der Ruhestellung. Ornith. Monatsber., **45**: 192-195, 2 text-figs., Dec. 13, 1937.—From a study of the hand and wing bones in *Archaeornis*, the author concludes that the wing when at rest could not have been folded with the hand turned backward, but must have taken a more lacertilian position, with the palm directed more or less anteriorly.
- STEINBACHER, GEORG. Schlangen als Raubvogelbeute. Ornith. Monatsber., **45**: 197-198, Dec. 13, 1937.—Describes the method of attacking and killing snakes by a Secretary-bird in the Berlin Zoological Garden, and the apparent caution used by the bird, contrasting it with the more direct method of *Circæthus gallicus*.
- STEWART, MALCOLM. Notes on the gannetries of Sule Stack and Sula Sgeir. British Birds, **31**: 282-294, pls. 11-12, Feb. 1, 1938.
- STONER, DAYTON. The American Egret in the Albany region. Univ. of N. Y. Bull. to Schools, **24**: 119-121, fig., Mar. 15, 1938.
- STONER, DAYTON. Three returns of a Bank Swallow. Science, n.s., **86**: 469-470, Nov. 19, 1937.—A banded bird was recovered at its nesting colony on four successive springs, having made at least five round-trip journeys between its nesting ground and its winter quarters, and nested four seasons in the same sector of the same colony. In two of the latter years it had a different mate and was eventually found dead and partly eaten by a rat in a burrow a few yards from the one occupied by it four years earlier.
- STONER, EMERSON A. A record of twenty-five years of wildfowl shooting on the Suisun Marsh, California. Condor, **39**: 242-248, text-fig. 67-69, Nov. 1937.—Of various ducks killed, the Pintail and American Widgeon together form nearly half.
- STONOR, C. R. On the case of a male Ruff (*Philomachus pugnax*) in the plumage of an adult female. Proc. Zool. Soc. London, **107** (ser. A): 85-88, 1 pl., 1937.
- STONOR, C. R. On the attempted breeding of a pair of Trumpeter Hornbills (*Bycanistes buccinator*) in the Gardens in 1936; together with some remarks on the physiology of the moult of the female. Proc. Zool. Soc. London, **107** (ser. A): 89-94, 1 pl., 1937.—Full molt took place while the female was immolated in the breeding box.

- STREICH, G., AND SWETOSAROW, E. Die natürliche Mauser der Entenvögel. I. *Biologia Generalis*, 13: 435-464, 1937.—A study of the molt of three different flocks of Domestic Geese yields the following facts. There are two molts, one beginning in May, the other in September, twenty days after the end of the first. There is practically no difference between males and females, but birds from southern Russia start molting earlier than birds from northern Russia, in exact correlation with an earlier laying period. Body plumage and tail-feathers begin to molt simultaneously, primaries and secondaries ten days later. The wing molt is ascending, the tail molt irregularly centrifugal. There is a noticeable loss of weight during the replacement of the wing-feathers. Data are given on the sequence and length of molt in different regions of the body.—E. MAYR.
- STÜLCKEN, KARL, AND BRÜLL, HEINZ. Vom Nestleben der Nachtschwalbe (*Caprimulgus e. europaeus*). *Journ. f. Ornith.*, 86: 59-73, pls. 2-9, Jan. 1938.—An account of the nesting of the European Nightjar in Germany, illustrated by a series of remarkable flashlight photographs, showing the adults feeding the young by night, and especially the actions of the adults when the nest is approached. The display of the male at dusk is described and the differing reaction when the nest is approached by day or by night. In the former case, the bird goes through the 'injury-feigning' action, but if an enemy appears at night, the 'threat reaction' takes place in which the bird gives a warning call as it walks about near the intruder.
- SUGDEN, JOHN W. The status of the Sandhill Crane in Utah and southern Idaho. *Condor*, 40: 18-22, text-fig. 8-12, Jan. 1, 1938.—Fish Springs, Utah, at the southern end of the Great Salt Desert, marks the southern limit of the present breeding range in the intermountain region.
- SWETOSAROW, E., AND STREICH, G. Die experimentelle Analyse des Geschlechts- und Saisondimorphismus im Gefieder der Enten. *Zool. Jahrb.*, 58: 225-240, 2 fig., 1 pl., 1937.—The sexual dimorphism in the Rouen Duck (domestic Mallard) is caused by the female hormone. Injection of this hormone in males and castrates changed the plumage to the female type. The threshold of different feathers is different, secondaries acquiring the female characters only at the application of high concentration of female hormone. Drakes which were castrated between September and April no longer molted into an eclipse plumage. If the castration took place between May and August the eclipse plumage was not suppressed. It is suggested, in view of the close relationship of male and female hormone, that the eclipse plumage of males is caused by female hormone developed in the male gonad during the period of its maximum development. The assumption of the authors that the lack of the breeding plumage of other species of ducks is due to a lowered threshold for female hormone sounds improbable, but could easily be checked by the castration of some Black Ducks.—E. MAYR.
- TAUBE, CLARENCE. Reminiscences of wildfowl migrations. Jack-pine Warbler, 16: 8-10, Apl. 1938.—In Michigan.
- TAVISTOCK, MARQUESS OF. The breeding of the Tahiti Blue Lory (*Coriphilus peruvianus*). *Avicult. Mag.*, (5) 3: 34-38, Feb. 1, 1938.—In the author's British aviaries.
- TEMPERLEY, GEORGE W. Notes on the bird life of the island of Raasay, Inner Hebrides. *Scottish Naturalist*, no. 229, p. 11-27, 1938.
- TOFTS, R. W. Winter birds in Nova Scotia. *Canadian Field-Nat.*, 52: 61, Apl. 1938.
- TYLER, BRUCE P. Blue Goose in Hawkins County. *The Migrant*, 9: 18, Mar.

- 1938.—A bird killed on the Holston River, below Church Hill, is the third record for eastern Tennessee.
- UBACH, FRANCISCO A. Observaciones de ornitología patologica. El Hornero, 6: 419-437, text-figs. 1-18, Sept. 1937.—Notes particularly on tuberculosis in birds in captivity.
- VAN BENEDEN, A. Les oiseaux diurnes la nuit. Le Gerfaut, 27: 103-108, 1937.—Notes on night habits of diurnal birds.
- VAN DEN BRINK, J. N. Het bedekken van de eieren door den patrijs, *Perdix p. perdix* (L.), gedurende den legtijd. Limosa, 10: 174-176, Dec. 1937.—An account of the interesting habit of the European Partridge of covering its eggs for concealment during the period while the set is being laid.
- VAN DOBBEN, W. H. Voorjaarstrek over Nederland (11e publicatie van het "Vogel-trekstation Texel"). Limosa, 10: 81-97, 3 text-figs., Sept. 1937.—Account of the migration of Starling, Chaffinch and Brambling in Holland.
- VAN ROSSEM, A. J., AND MARQUESS HACHISUKA. A new hummingbird of the genus *Saucerottia* from Sonora, Mexico. Trans. San Diego Soc. Nat. Hist., 8: 407-408, Jan. 18, 1938.—*Saucerottia florenceae* from Rancho Santa Barbara, twenty miles northeast of Guirocoba, Sonora.
- VENABLES, L. S. V. Birds seen in two winter transects of the North Atlantic. British Birds, 31: 295-296, Feb. 1, 1938.—"The increase of Kittiwakes and the decrease of Fulmars and Great Shearwaters should be noted when compared with the summer months."
- WACHS, HORST. Schutz der Seeschwalben zur Brutzeit durch biologische Trennung. Ornith. Monatsber., 45: 199-201, Dec. 13, 1937.—On the North Sea coasts, the nesting terns are much harassed by gulls, that rob the nests of eggs or young. It is found that this may be largely prevented by the simple method of stringing wires above the nesting areas of the terns so as to make interspaces not more than two or three meters square. The terns in alighting on their nests come down almost vertically, and easily pass between the wires, whereas the larger gulls in attacking the nests come to the ground at a wide angle. In attempting to do this, they are prevented by the wires.
- WENDNAGEL, AD. Ein Bastard zwischen Weiss- und Schwarzstorch. Ornith. Beobachter, L'Ornithologiste, 35: 1-6, 9 figs., Oct. 1937.
- WETMORE, ALEXANDER. The tibiotarsus of the fossil bird *Bathornis veredus*. Condor, 39: 256-257, text-fig. 70, Nov. 1937.—A long section of the tibiotarsus of this Oligocene bird is figured from a specimen lately discovered in the Middle Titanotheres beds of Oligocene age, on Indian Creek, South Dakota.
- WETMORE, ALEXANDER. A Miocene booby and other records from the Calvert formation of Maryland. Proc. U. S. Nat. Mus., 85: 21-25, 3 figs., 1938.—*Microsula*, new subgenus for *Sula avita*, new species.
- WETMORE, ALEXANDER. Another fossil owl from the Eocene of Wyoming. Proc. U. S. Nat. Mus., 85: 27-29, text-fig. 4-5, 1938.—A new species, *Protostrix mimica*, from the Wasatch formation, twelve miles north of Worland, is a fourth known species of the Protostrigidae.
- WETTSTEIN, OTTO VON. Die Vogelwelt der Aegäis. Journ. f. Ornith., 86: 9-53, map, Jan. 1938.—An annotated list of birds of the Grecian archipelago.
- WHITE, C. M. N. [Notes on birds of the Solomon Islands.] Bull. British Ornith. Club, 58: 46-48, Jan. 5, 1938.
- WHITLOCK, F. LAWSON. Birds of the Norseman district, Western Australia. The Emu, 37: 106-114, Oct. 1, 1937.

- WHITLOCK, F. LAWSON. A new petrel of the genus *Puffinus*. The Emu, 37: 116-117, Oct. 1, 1937.—*P. leptorhynchus* Mathews.
- WILSON, HUGH. Notes on the Night Parrot, with references to recent occurrences. The Emu, 37: 79-87, map, Oct. 1, 1937.—Rediscovery of *Geopsittacus occidentalis* and list of known specimens.
- WINTERBOTTOM, J. M. Bird population.—VIII. The avifauna of Fort Jameson, Northern Rhodesia, 1932-35. Proc. Zool. Soc. London, 107 (ser. A): 191-204, 1937.
- WOOD, CASEY A. Some of the commoner birds of Ceylon. Smithsonian Rept. for 1936: 297-302, 1938.
- WOOD JONES, FREDERIC. The question of species: with particular reference to the Tubinares. The Emu, 37: 121-127, Oct. 1, 1937.
- WOOD JONES, FREDERIC. The olfactory organ of the Tubinares. The Emu, 37: 128-131, pl. 17-21, Oct. 1, 1937.—"It is obvious that the whole olfactory apparatus of *Diomedea* must be regarded as a highly-developed and fully-functional organ of smell."
- ZIMMER, KARL. Methoden zur Messung der Atemfrequenz bei Vögeln.—Sitz.-ber. Ges. Nat. Freunde, Berlin, 1936, pp. 142-156.—Quietly sitting hummingbirds had a breathing frequency of 170-250 times per minute. A sunbird (*Cinnyris habessinicus*) 100 (times per minute), a siskin (male 102, female 114), a goldfinch (102) and a Black-capped Warbler (102), showed similar figures. Larger birds were breathing more slowly; a crow 30.6, a pigeon 28.8, and a loon 17.4. Walking and flying increased the frequency very rapidly, a flying pigeon breathing 450 times per minute, 15 times as fast as when quietly sitting.—E. MAYR.
- ZOTTA, ANGEL B. Una nueva subespecie de pecho colorado, *Pezites militaris catamarcanus*, subsp. nov. El Hornero, 6: 449-454, text-fig., Sept. 1937.—From Catamarca Province, Argentina.
- ZOTTA, ANGEL R. Notas ornitologicas. El Hornero, 6: 477-483, 1 text-fig., Sept. 1937.—The notes include observations on *Turdus subalaris*, the first record of the Groove-billed Ani in Argentina, notes on the Giant Hummingbird in Argentina.
- ZOTTA, ANGEL R. Lista sistematica de las aves argentinas. El Hornero, 6: 531-554, Sept. 1937.—Continuation of his list of birds of Argentina, from Columbiformes to Micropodiformes.
- ZOTTA, ANGEL R., AND DA FONSECA, SECUNDINO. Sinopsis de los Ciconiiformes argentinos. El Hornero, 6: 395-418, text-figs. 11-21, Sept. 1937.—Conclusion of a synopsis of the characters of Argentine storks, ibises, and flamingoes.

OBITUARIES

NORMAN MCCLINTOCK, an Associate of the American Ornithologists' Union for thirty-seven years, died in a hospital at Orlando, Florida, February 26, 1938, at the age of sixty-nine. Two weeks previously he had undergone an operation. He was born in Pittsburgh, Pennsylvania, June 13, 1868, one of a family of several children of Oliver and Clara (Childs) McClintock. He graduated from Yale University in 1891, and in 1906, married Miss Ethel M. Lockwood of Syracuse, New York. In 1925, he was appointed on the faculty of the University of Pittsburgh with the title of photo-naturalist and in 1932, a special lecturer and photo-naturalist at Rutgers University. Since then he made his home at New Brunswick, New Jersey. He was a member of the American Association for the Advancement of Science, the Ecological Society of America and in 1900 was elected an Associate of the Union.

McClintock was a keen observer and through patience, ingenuity and careful attention to details, developed into one of the most successful wildlife photographers. Through association with George Shiras, III, he became interested in nature photography and soon became an expert in securing flashlight pictures, especially of big game and in taking motion pictures. Modest and retiring in disposition, he published comparatively little but presented his material in the form of lectures and public addresses. He was a frequent attendant at the meetings of the Union and occasionally contributed to the programs and to the pages of 'The Auk.' In a paper entitled 'A Hermit Thrush study,' which appeared in 'The Auk' in 1910, he summarized the results of careful observations on this bird on its breeding grounds in the Huron Mountains northwest of Marquette, Michigan. At the Pittsburgh meeting in 1924, he presented a paper on 'A Robin study and the spring dance of the Heath Hen' but without illustrations. At the Washington meeting in 1928, he showed some of his best motion pictures depicting the Wild Turkey in Pennsylvania and a year later, in Philadelphia, exhibited motion pictures under the title 'Reminiscences of Robert Ridgway and other Pictures.'

He specialized in time-lapse motion pictures of plant movements, developed the application of telephotography to a high degree in making motion pictures and produced some of the finest examples of work in this field. Although known to those who were fortunate enough to attend his lectures or see his pictures, his work should be known to a much larger circle of nature students.—T. S. P.

We learn with regret of the following deaths: SERGIUS ALEXANDROVICH BUTURLIN, of Moscow, an Honorary Fellow since 1916, whose name is associated with the discovery of the breeding grounds of Ross's Gull; DR. WILLIAM EAGLE CLARKE of Edinburgh, an Honorary Fellow since 1921; DR. JOHANNES W. THIENEMANN, a Corresponding Fellow, founder and formerly director of the ornithological station at Rossitten, East Prussia; GEORGE BIRD GRINNELL, of New York City, a Fellow of the Union since 1883; WILL EDWIN SNYDER, of Beaver Dam, Wisconsin, Honorary Life Associate, who was instantly killed by an automobile on November 10, 1937.

NOTES AND NEWS

THE COUNCIL OF THE A. O. U.

At the meeting of the American Ornithologists' Union next October, three of the most experienced members of the Council retire and are not eligible for immediate reelection:—H. C. Oberholser, T. S. Roberts, and P. A. Taverner. In their place three new councillors to serve for the following three years must be chosen. Inasmuch as the business of the Union is largely in the hands of its Council, it is important to consider carefully the qualifications desired in possible candidates. Hitherto little thought has been given to this matter, because prior to the adoption of the rotating Council, what really happened was that all, or most, of the old members were usually reelected. This is now changed, and each year three new members are to be elected. The Union provides no machinery for the nomination of Councillors prior to the business meeting, and it therefore becomes necessary for the Fellows and Members to consider, discuss, choose, or eliminate possibilities in their own minds before the meeting. Again, we may be reminded that Members as well as Fellows are eligible to serve on the Council. The only restriction that seems at all advisable is that candidates be chosen who may reasonably be expected to attend the meetings, as an absent Councillor is merely an empty chair during the transaction of business. —HERBERT FRIEDMANN.

A NATIONAL exhibition of Auduboniana was held at the Academy of Natural Sciences, Philadelphia, April 26 to June 1, in commemoration of the hundredth anniversary of the publication of the elephant folio of 'The birds of America.' A handsomely printed 44-page catalogue, bound in stiff-paper covers, describes the objects here brought together and may be obtained from the Academy for twenty-five cents a copy, post paid. An account of Audubon and his association with the Academy precedes a descriptive list of the pictures and articles exhibited. The former include many of Audubon's original crayon and water color drawings loaned by the Harvard College Library, original oil paintings of birds loaned by the Museum of Comparative Zoölogy, as well as manuscripts, copper plates, the five elephant-folio volumes, Audubon's guns, and other interesting mementoes loaned from various sources. The catalogue contains reproductions of the portrait of Audubon by his son, John Woodhouse Audubon, as well as of the plates of Wild Turkey, Prairie Chicken, Passenger Pigeon, Baltimore Oriole and Swamp Sparrow; the portrait of Lafayette painted by Audubon, and two of his quadrupeds. It forms an attractive memorial, of value to all who are interested in Audubon and his work.

THE newly formed Texas Federation of Nature Clubs has started an active campaign for a wiser use of the State's natural resources, and has issued as the first gun of its advance, an illustrated pamphlet championing the Brown Pelican, a spectacular and harmless species which is in danger of being exterminated on the Texas coast through thoughtless persecution. The Secretary of the Federation is Mr. Jerry E. Stillwell, 7460 San Benito Way, Dallas, Texas.

THE President of the American Ornithologists' Union, in pursuance of his suggestion that the Union should take a more active share in certain aspects of ornithology, has appointed a Research Committee, with the following as chairmen of their respective subcommittees: Anatomy, Dr. A. H. Miller; Genetics, Dr. Leon J. Cole; Migration, Homing, and related phenomena, Dr. Ernst Mayr; North American

Faunistics, P. A. Taverner (tentative); Physiology, Dr. S. C. Kendeigh; Psychology, Territory, Individual Behavior, Mrs. Margaret M. Nice.

THERE is much valuable material, largely of local interest, in the various mimeographed 'journals' at present issued by several active ornithological societies in the eastern United States and Canada, much of which is likely to prove ephemeral since such publications are seldom permanently preserved in libraries. Two of these have lately, however, graduated to the class of formal publications, and are issuing their current volumes as regularly printed journals, 'The Flicker,' issued by the Minnesota Bird Club, Minneapolis, and 'The Jack-Pine Warbler,' published by the Michigan Audubon Society. May success attend them!

THE National Park Service of the U. S. Department of the Interior has issued, December, 1937, in mimeographed form, with covers, a check-list of the birds of the National Parks. For each of the Parks a carefully prepared and briefly annotated list of the birds ascertained to occur within or close to its boundaries, is given and the lists are arranged alphabetically by the titles of the twenty-three Park areas. Its object is to make available to visitors and students such information as now exists and to stimulate the gathering of additional data. It would have been helpful if, in addition, a brief list of the Parks and their location or at least a map of the United States showing their situation could have been added. The whole, clipped together in stiff covers will prove very convenient to the many summer tourists who annually include these reservations in automobile trips. The matter contained, it is stated, is "not for publication."

STATISTICS issued by the U. S. Department of Agriculture show that for the year 1936, a total of 6,658,158 hunting licenses was issued in the United States, bringing in \$10,466,237.37. The sales of Migratory Bird Hunting Stamps for the same period numbered 603,623. An analysis of these figures by States is given. It would be interesting—perhaps appalling—to know the total resulting destruction of animal life.

FOR a generous contribution toward the expense of the colored plate in the January 'Auk,' grateful acknowledgment is made to Mr. John B. Semple.

IN reply to many inquiries, Mr. Arthur C. Bent writes that the eleventh volume of his 'Life Histories of North American Birds' is now in press and about to appear, the twelfth has gone to the publishers and the thirteenth is largely written. He is now ready to receive notes and photographs relating to any of the North American flycatchers, larks and swallows for use in the fourteenth volume of this work.

WE note with satisfaction that Dr. Alexander Wetmore has been elected an Honorary Member of the British Ornithologists' Union and that Percy A. Taverner has been made a member of the Royal Society of Canada,—honors well merited.

THE AMERICAN ORNITHOLOGISTS' UNION AT A GLANCE

ORGANIZED—in New York City, Sept. 26, 1883; Incorporated—in Washington, D. C., Nov. 15, 1888.

OBJECTS: "The advancement of its members in Ornithological Science; the publication of a journal of Ornithology and other works relating to that science; the acquisition of a library; and the care and collection of materials relating to the above objects, under the restrictions and regulations established in its By-Laws."

OFFICERS: President, two Vice-Presidents, Secretary, Treasurer, and 9 Councilors. Officers and ex-Presidents are ex-officio members of the Council.

MEMBERS: Associates (unlimited), Members (125), Corresponding Fellows (100), Honorary Fellows (25), Fellows (50), Fellows Emeritus, Patrons. (Total membership in 1936 about 2000.)

DUES: Annual—Associates \$3, Members \$4, Fellows \$5.

Life-Associates \$50, Life-Members \$75, Life-Fellows \$100; Patrons \$1000.

INCOME: From annual dues, sale of publications, life memberships, and contributions.

MEETINGS: Annual—usually in October or November.

PUBLICATIONS: 'The Auk,' a quarterly journal in 53 volumes, with 4 general indexes: 1876-1900, 1901-1910, 1911-1920, 1921-1930. 'Check-list of North American Birds': 1st ed., 1886; 2d ed., 1895; 3d ed., 1910; 4th ed., 1931. 'Code of Nomenclature,' 1886; Revised ed., 1908. (See Auk, '24, 142.)

BREWSTER MEDAL: The income from a fund of \$7250, established in 1919 by the friends of William Brewster, awarded biennially to the author of the most important work relating to the birds of the Western Hemisphere published during the preceding six years. Awarded in 1921 to Robert Ridgway, in 1923 to A. C. Bent, in 1925 to Todd and Carriker, in 1927 to John C. Phillips, in 1929 to C. E. Hellmayr, in 1931 to Mrs. Florence M. Bailey, in 1933 to F. M. Chapman, and in 1935 to H. L. Stoddard.

WHERE TO FIND FURTHER INFORMATION

ADDRESSES OF OFFICERS AND MEMBERS—Annual list in April Auk.

THE AUK (LOCATION OF SETS)—Auk, '19, 634; '20, 348; '24, 207; '29, 584.

THE AUK IN PUBLIC LIBRARIES—Auk, '30, 609.

BIOGRAPHIES OF DECEASED MEMBERS—Auk, '35, lxviii.

BREWSTER MEDAL—Auk, '20, 29; '22, 86; '24, 125; '25, 484; '26, 69; '28, 71; '30, 219; '32, 52; '34, 53; '36, 57.

BY-LAWS: Auk, '27, xi.

DATES OF PUBLICATION OF THE AUK (1912-1936) follow the Index in each volume.

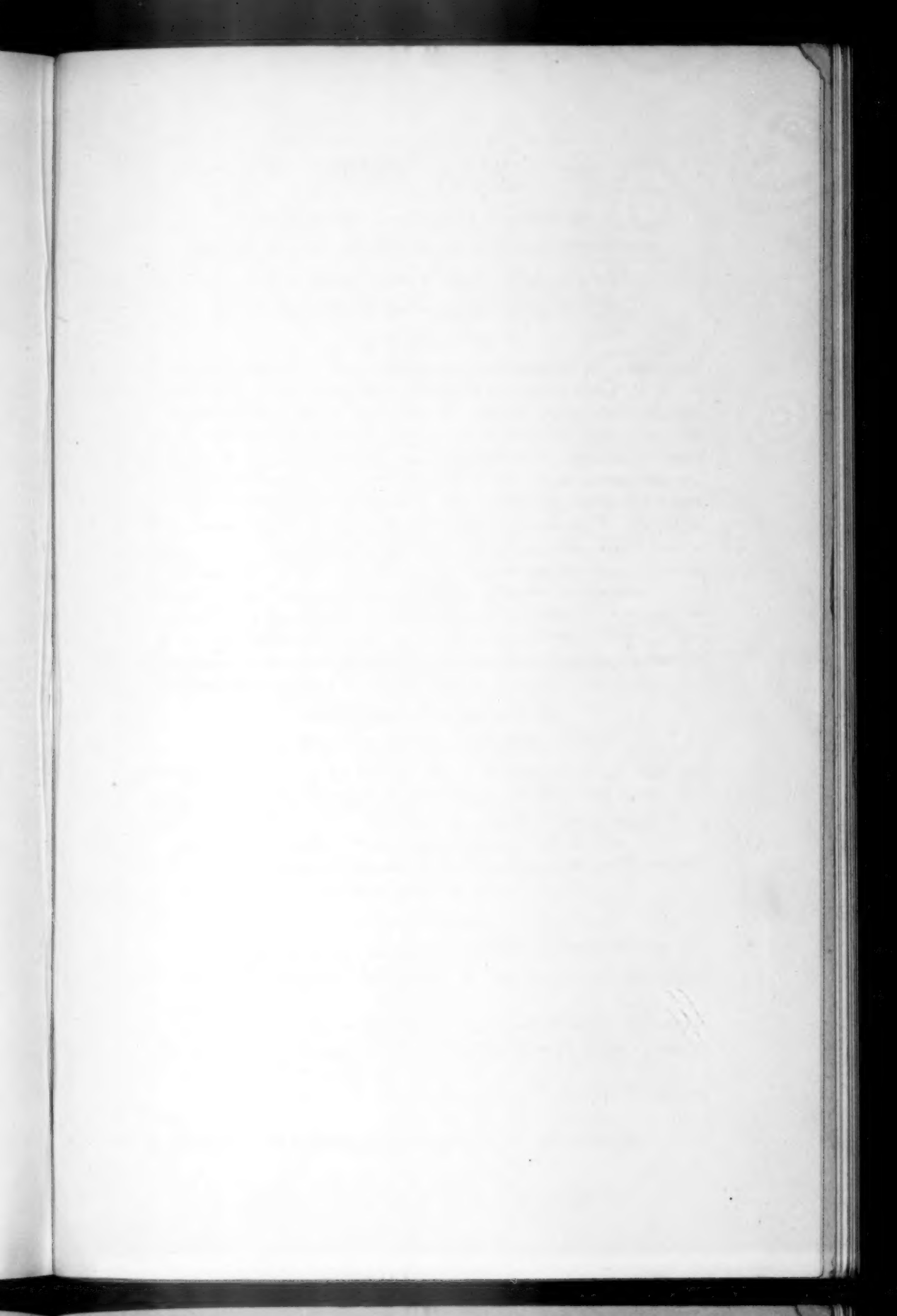
HISTORY OF THE UNION: Allen, J. A., 'A Seven Years' Retrospect,' 1891; 'The A. O. U.,' Bird-Lore, 1899, 143.

Palmer, T. S., 'The A. O. U.,' Am. Mus. Journal, '18, 473; 'Looking Backward,' Auk, '24, 139; Fifty years progress of American Ornithology, 1933, 7-27.

MEETINGS: Auk, '24, 143; '30, back cover of October number.

MEMBERSHIP:—Auk, '24, 140; Fellows, '18, 110; Foreign Members, '18, 266; Members, '18, 384; Associates, '18, 513.

PERMANENT FUNDS: Auk, '20, 513.



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(See review in 'The Auk,' for October, 1934, p. 542)

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